DIGITAL PROJECTION

USER MANUAL

INSTALLATION AND QUICK-START GUIDE
CONNECTION GUIDE
OPERATING GUIDE
REMOTE COMMUNICATIONS GUIDE
REFERENCE GUIDE

HIGHlite Cine 335 3D Series

High Brightness Digital Video Projector

Rev B March 2013

113-835B

About This Document

Please follow the instructions in this manual carefully to ensure safe and long-lasting use of the projector.

Keep this manual handy for future reference.

Symbols used in this manual

Many pages in this document have a dedicated area for notes. The information in that area is accompanied by the following symbols:

ELECTRICAL WARNING: this symbol indicates that there is a danger of electrical shock unless the instructions are closely followed.

WARNING: this symbol indicates that there is a danger of physical injury to yourself and/or damage to the equipment unless the instructions are closely followed.

NOTE: this symbol indicates that there is some important information that you should read.

Product revision

Because we at Digital Projection continually strive to improve our products, we may change specifications and designs, and add new features without prior notice.

Legal notice

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Notes

Introduction

Congratulations on your purchase of this Digital Projection product.

Your projector has the following key features:

- HDMI 1.4 for Side by Side, Frame Packing & Top Bottom Formats
- Dual Flash Processing can be used to multiply the displayed frame rate for 3D sources
- Dual Pipe Processing: Two sources in parallel for Left and Right Eyes
- Synchronisation of active glasses or polarising switcher
- High Bandwidth Digital & Analogue Receiver with 10 Bit A-D
- 24p and 1080p native display
- DynamicBlack™ for improved black levels in dark scenes
- Control via LAN and RS232
- Motorised lens mount

A serial number is located on the back of the projector. Please record it here:

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HIGHlite Cine 335 3D Series

High Brightness Digital Video Projector

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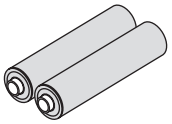
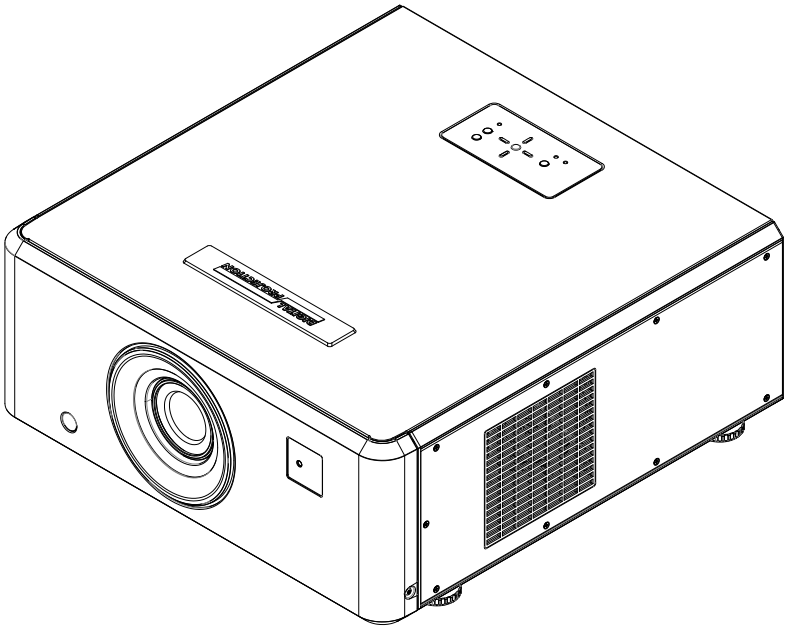
What's In The Box?

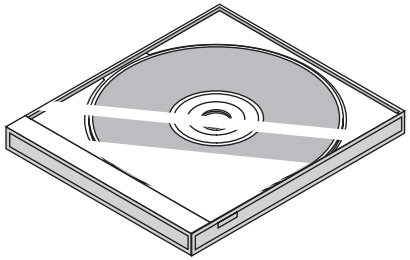
Remote control (110-024)



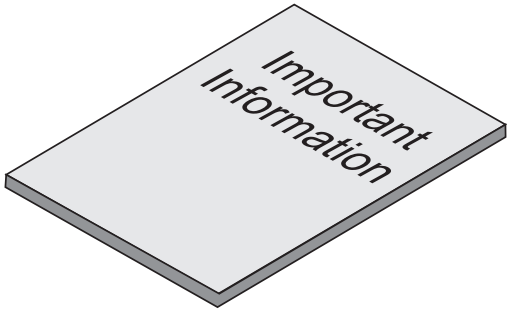
2x AA batteries



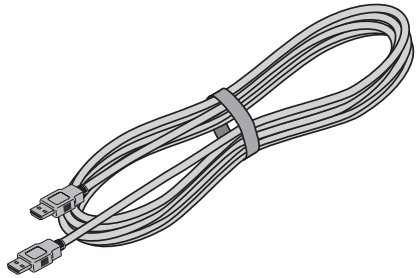
Projector



User Guides on CD (113-834)



Important Information (113-841)



HDMI cable

Notes

Make sure your box contains everything listed. If any pieces are missing, contact your dealer.

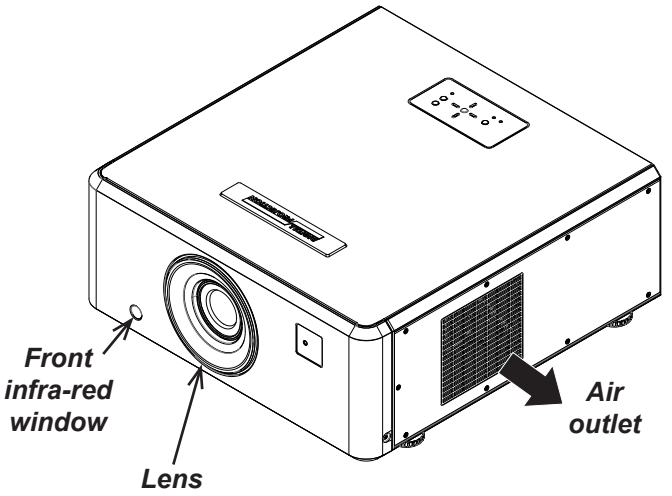
You should save the original box and packing materials, in case you ever need to ship your projector.

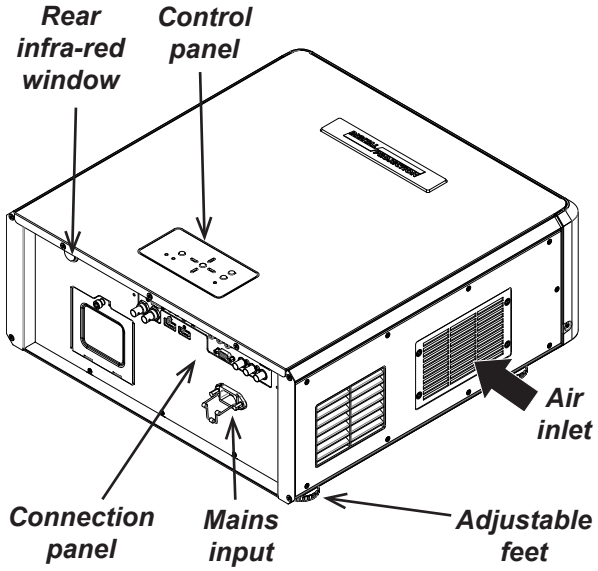
The projector is shipped without a lens.

A power cable suitable for the destination territory will also be supplied with the projector.

Getting To Know The Projector

Front and rear views

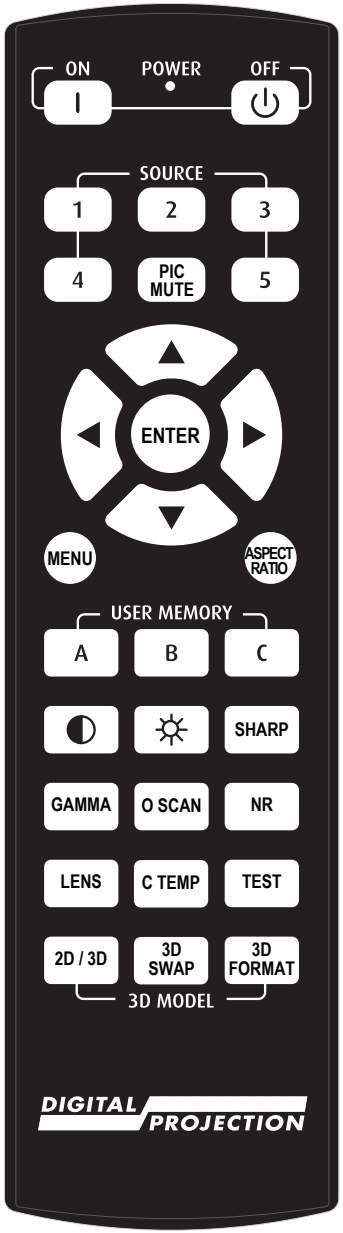


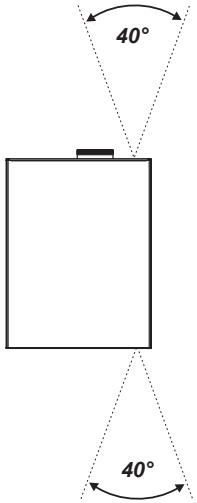


Notes

Remote control

Button	Function
POWER ON / OFF	Switch the projector on and off.
SOURCE 1-5	Change the active input source.
PIC MUTE	Switch to low power mode, low fan speed and display a black image.
ARROW buttons	Navigate up, down, left and right, increment and decrement values, cycle through items
ENTER	Open a sub-menu, execute a command, confirm a choice.
MENU	Show and hide the OSD.
ASPECT RATIO	Cycle through available aspect ratios.
USER MEMORY A - C	Recall Preset A - C.
CONTRAST	Show and hide the **Contrast** slider.
BRIGHTNESS	Show and hide the **Brightness** slider.
SHARP	Show and hide the **Sharpness** slider.
GAMMA	Cycle through **Gamma** settings.
O SCAN	Cycle through **Overscan** modes.
NR	Show and hide the **Noise Reduction** slider.
Lens	Cycle through **Lens Controls**.
C TEMP	Cycle through **Color Temperature** settings.
TEST	Cycle through test patterns.
2D / 3D	Switch 3D on and off.
3D SWAP	Change the dominant channel.
3D FORMAT	Cycle through available 3D formats.



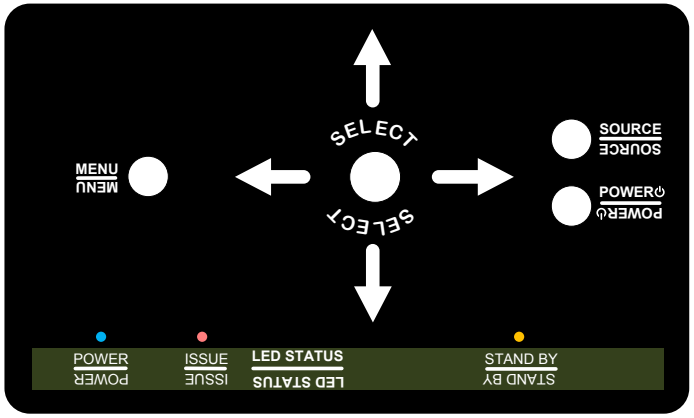


Infra-red reception

Notes

*For full details of how to use the controls and the menu system, see the **Operating Guide**.*

Control panel and indicators

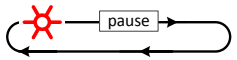
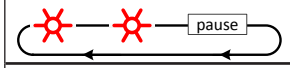
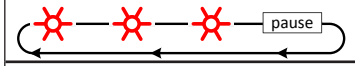
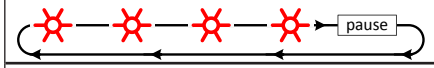
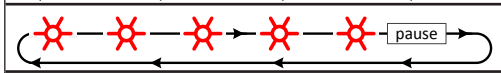


POWER indicator (blue) and STANDBY indicator (amber)

The blue POWER indicator will light when the projector is ON, and will flash when the projector is cooling down or warming up. It will be off when the projector is in STANDBY mode. The amber STANDBY indicator will light when the projector is in STANDBY mode.

Condition	Power indicator (blue light)	Standby indicator (amber light)
Standby	Off	On
Cooling / Warming up	Flashing	Off
Power on (Normal)	On	Off

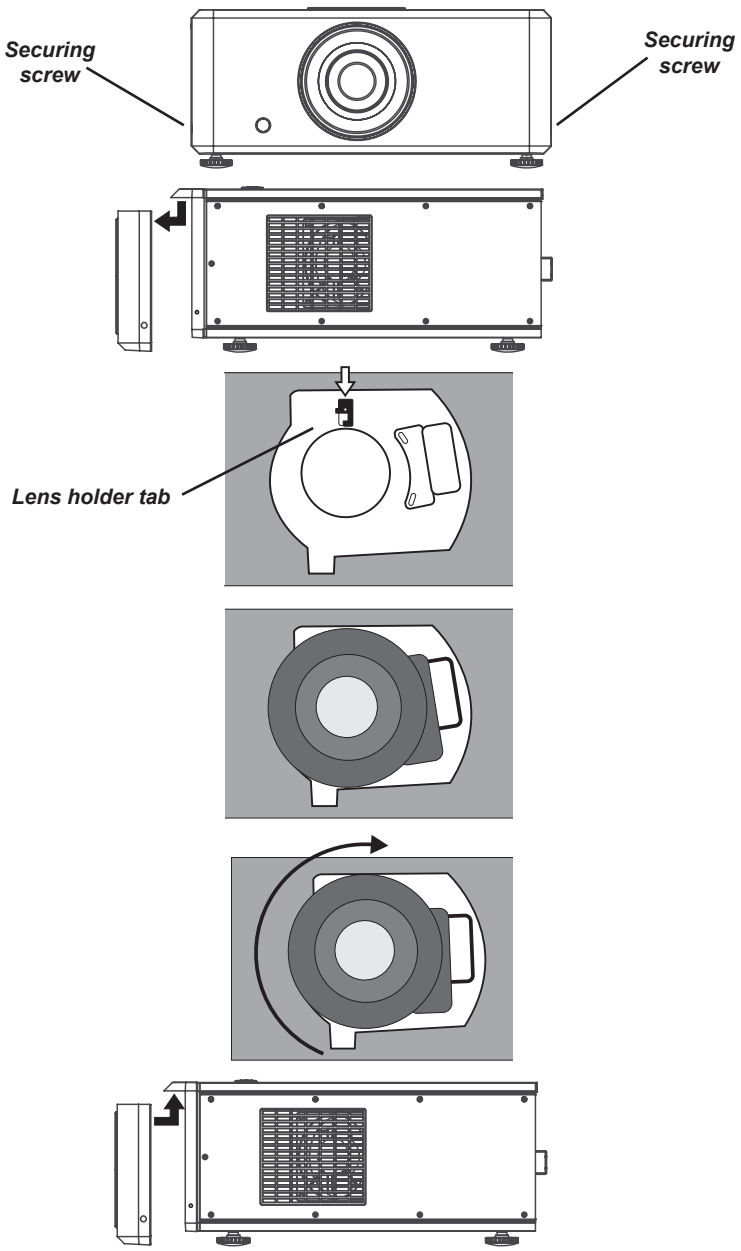
ISSUE indicator (red)

Condition	Issue indicator (red light)	
Lamp fail		Flash once, pause, then repeat.
Lamp door open		Flash twice, pause, then repeat.
Fan fail		Flash three times, pause, then repeat,
Over temperature		Flash four times, pause, then repeat.
Filter fail		Flash five times, pause, then repeat.
System error		On.

Notes

Fitting The Lens

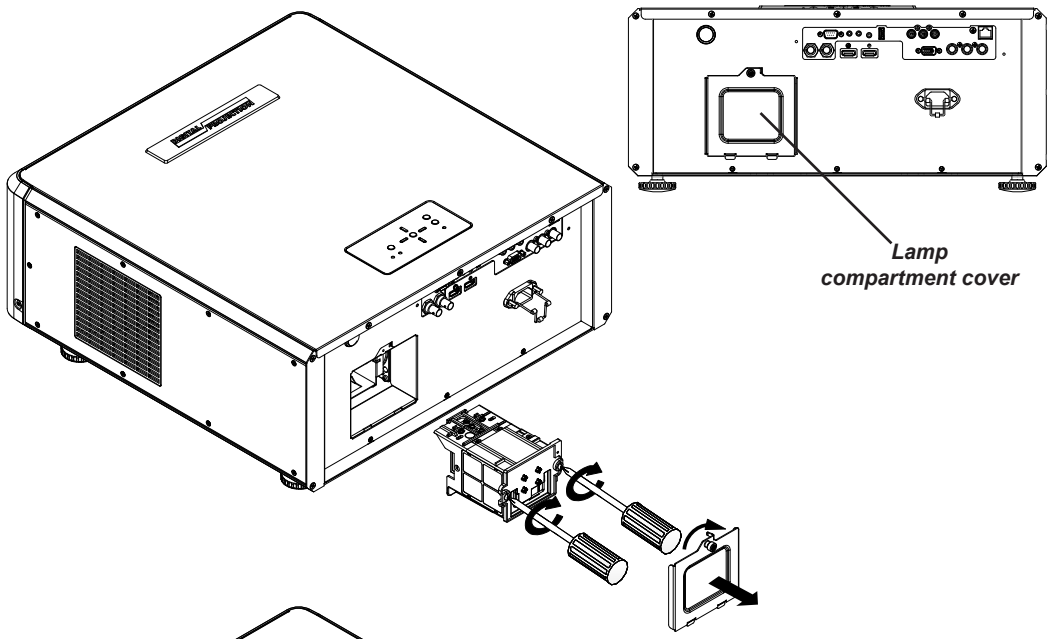
1. Remove the two screws securing the front cover to the body of the projector.
2. Push the front cover down, then pull it away from the projector.
3. Push down the lens holder tab.
4. Hold down the tab, and insert the lens into the lens aperture, making sure that the plug on the zoom drive mechanism lines up with the socket on the right of the lens aperture.
5. Still holding down the tab, push the lens in firmly as far as it will go.
6. Rotate the lens clockwise as far as it will go.
7. Release the lens holder tab.
8. Replace the front cover and secure it with the screws.



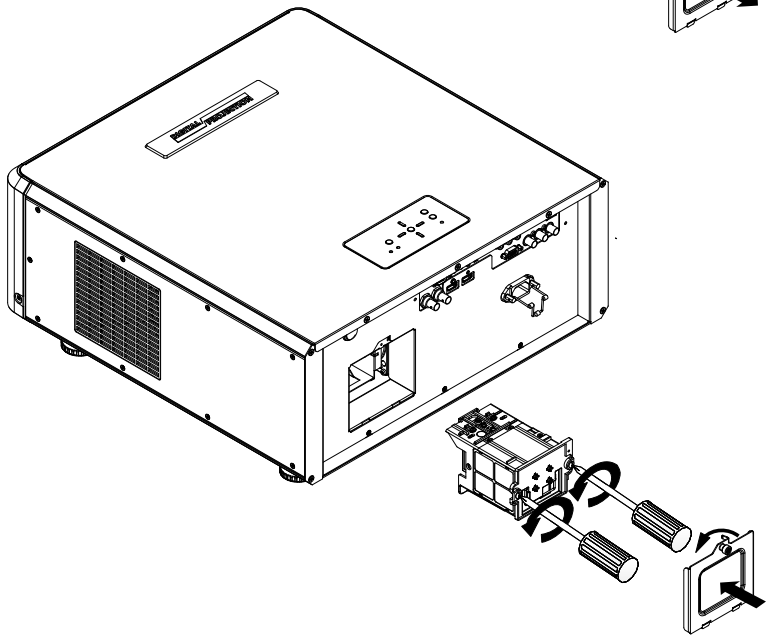
Notes

Changing The Lamp

1. Remove the lamp compartment cover.
   Unscrew the two captive screws securing the lamp module and pull firmly to remove the lamp module.



2. Insert a new lamp module. Fasten the screws and replace the lamp compartment cover.



Notes

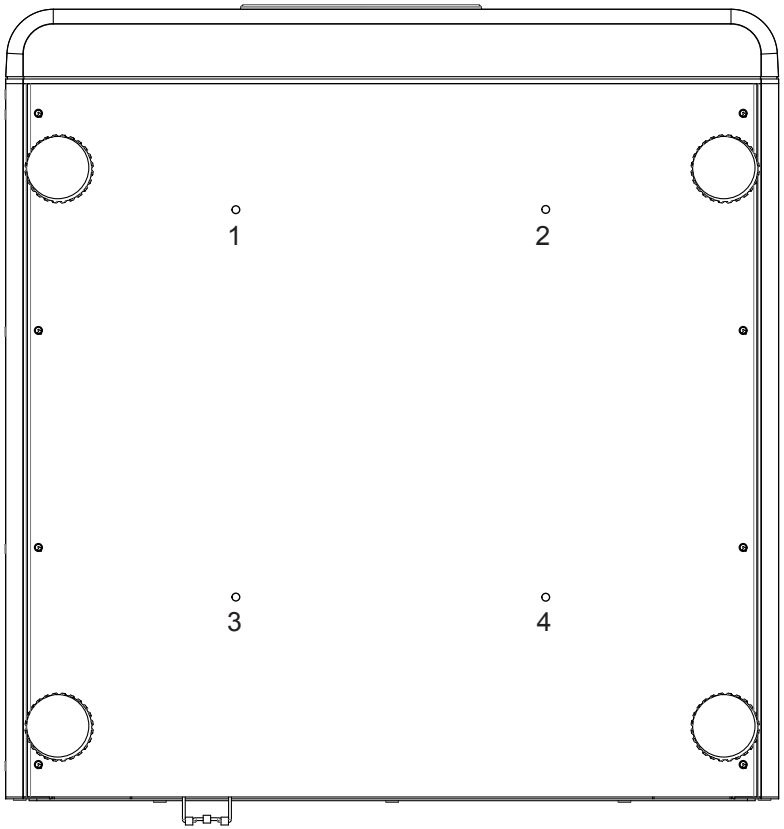
Always allow the lamp to cool for 5 minutes before:

- disconnecting the power
- moving the projector
- changing the lamp

Positioning The Screen And Projector

1. Install the screen, ensuring that it is in the best position for viewing by your audience.
2. Mount the projector, ensuring that it is at a suitable distance from the screen for the image to fill the screen. Set the adjustable feet so that the projector is level, and perpendicular to the screen.

Alternatively, four M4 bolts (max length 12 mm [0.5 in]) can be used to attach the projector to a ceiling mount (optional accessory). The illustration below shows the positions of the feet for table mounting, and the fixing holes for ceiling mounting.



Location of the four ceiling mount holes on the projector underside

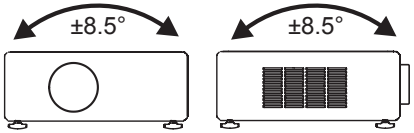
Notes

Always allow the lamp to cool for 5 minutes before:

- disconnecting the power
- moving the projector
- changing the lamp

Ensure that there is at least 30cm (12in) of space between the ventilation outlets and any wall, and 10cm (4in) on all other sides.

Do not tilt the projector more than ±8.5° from side to side when in use, as this may cause serious lamp failure, damage the lamp module and cause extra cost on replacement.



For exact measurements, please refer to the CAD drawings.

*See **Positioning the screen and projector** in **the Reference Guide** for more information.*

Operating The Projector

Switching the projector on

- Connect the power cable between the mains supply and the projector.
- Wait until the self-test has completed and the standby indicator on the projector control panel shows amber. The lamp will be off and the projector will be in STANDBY mode.
- Press (ON) on the remote control or the control panel to switch the projector ON. The power indicator on the control panel flashes blue for a few seconds whilst the lamp comes up to full brightness. When the projector is fully switched on and ready for use, the power indicator stops flashing and remains on.

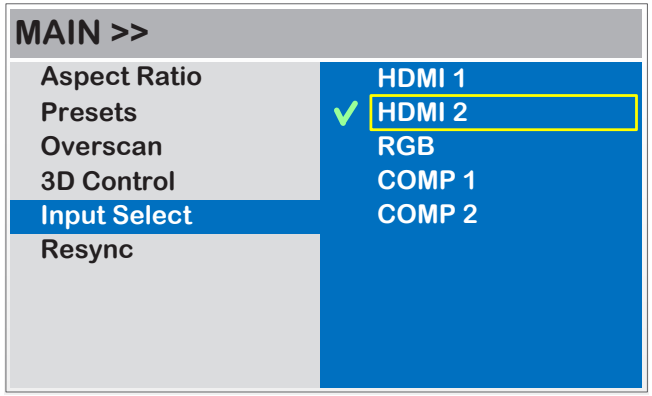
Selecting an input signal or test pattern

Input signal

- Connect an image source to the projector. The signal should be automatically detected by the projector, and should be displayed within two or three seconds.

If more than one signal is connected, select the image you want to display in one of the following ways:

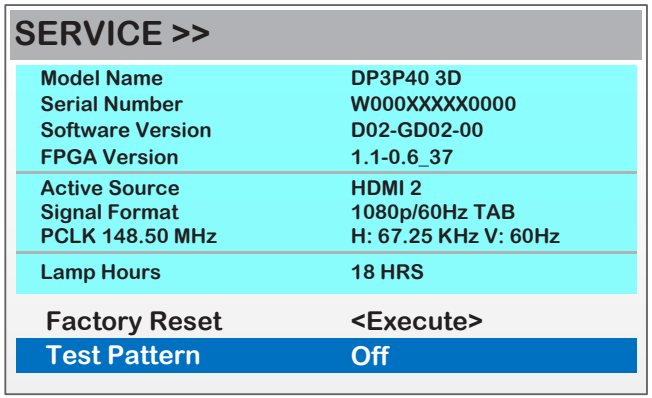
- Press one of the **Input buttons**, (1) to (5) on the remote control, or
- Open the On-screen display (OSD) by pressing the **MENU** button on either the control panel or the remote.
  Navigate to **Main > Input Select**.



Test pattern

If no image source is connected to the projector, you can display a test pattern in one of the following ways:

- Press the **TEST** button on the remote and then use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to switch between patterns.
- Open the On-screen display (OSD) and access the **Service** menu, then navigate to **Test Pattern**.
  Use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to switch between patterns.



Notes

*See the **Connection Guide** for further information about the available inputs and connections.*

*For full details of how to use the controls and the menu system, see the **Operating Guide**.*

Please note that the values shown in this illustration may differ significantly on your OSD.

Adjusting the lens

To access lens controls, do either of the following:

- Press the **LENS** button on the remote.
- Access the **Control** menu and navigate to **Lens Control**.

Use the arrow buttons to adjust **Zoom**, **Focus** and **Shift**.

Adjusting the image

Projector mode (orientation) and OSD settings

These can be set from the **System** menu.

Aspect ratio

To set up an aspect ratio for your image, do either of the following:

- Press the **ASPECT RATIO** button on the remote control to cycle through the available settings.
- Access the **Main** menu and then select **Aspect Ratio**.

Picture

To change brightness and contrast, do either of the following:

- Press **BRIGHTNESS** or **CONTRAST** on the remote control, then use the arrow buttons to move the sliders.
- Access the **Image** menu and adjust the **Brightness** and **Contrast** settings.

3D

In the **Main** menu, use the **3D Control** sub-menu.

Switching the projector off

1. Press **POWER** on the control panel or the remote control, then press the button again to confirm.
   The lamp will switch off, the STANDBY indicator on the control panel will start flashing and the projector will be in STANDBY mode while cooling off.
2. Wait until the power indicator has stopped flashing and the fans have stopped working, then disconnect the power cable.

Notes

Always allow the lamp to cool for 5 minutes before:

- disconnecting the power
- moving the projector
- changing the lamp

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DIGITAL PROJECTION

CONNECTION GUIDE

HIGHlite Cine 335 3D Series

High Brightness Digital Video Projector

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Signal Inputs

HDMI 1, HDMI 2

Two identical single HDMI 1.4 inputs which support HDCP 1.1 and DVI 1.0.

Used together, the two sockets become a dual HDMI input which supports **Dual Pipe** 3D.

RGB

In the **Advanced Image** menu, set **Colorspace** to **Auto**, or if necessary to **RGB PC**.

Component 1

RGsB

In the **Advanced Image** menu, set **Colorspace** to **Auto**, or if necessary to **RGB Video**.

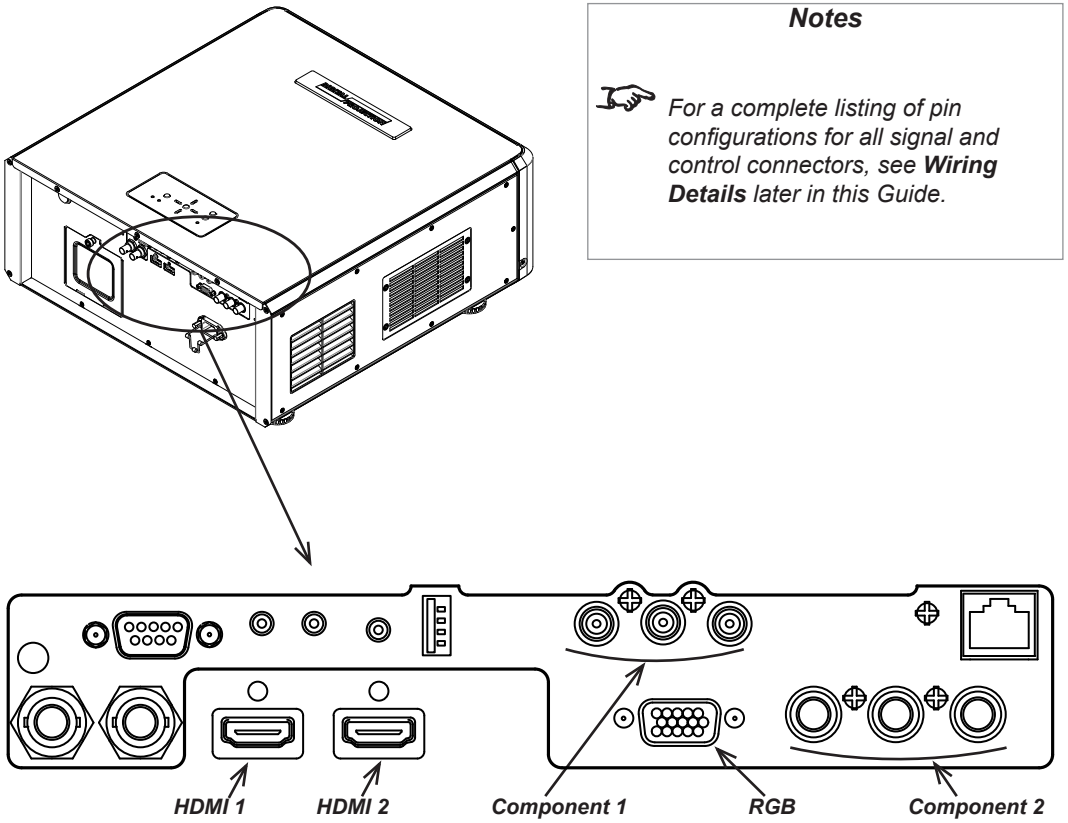
YPbPr

In the **Advanced Image** menu, set **Colorspace** to **Auto**, or if necessary to **YPbPr or YCbCr**.

Component 2

YPbPr

In the **Advanced Image** menu, set **Colorspace** to **Auto**, or if necessary to **YPbPr or YCbCr**.



Notes

*For a complete listing of pin configurations for all signal and control connectors, see **Wiring Details** later in this Guide.*

3D connections

3D sources up to 60Hz requiring frame doubling and left/ right interleaving

1. Connect the HDMI 1 or HDMI 2 input.
2. Set **3D Format** in the **3D Control** menu to **Auto**, except when the projector has problems selecting between **Side by Side (Half)**, **Top and Bottom** and **Frame Sequential**.

Dual Pipe 3D

1. Connect to both HDMI Inputs.
2. Set **3D Format** in the **3D Control** menu to **Dual-Pipe**.

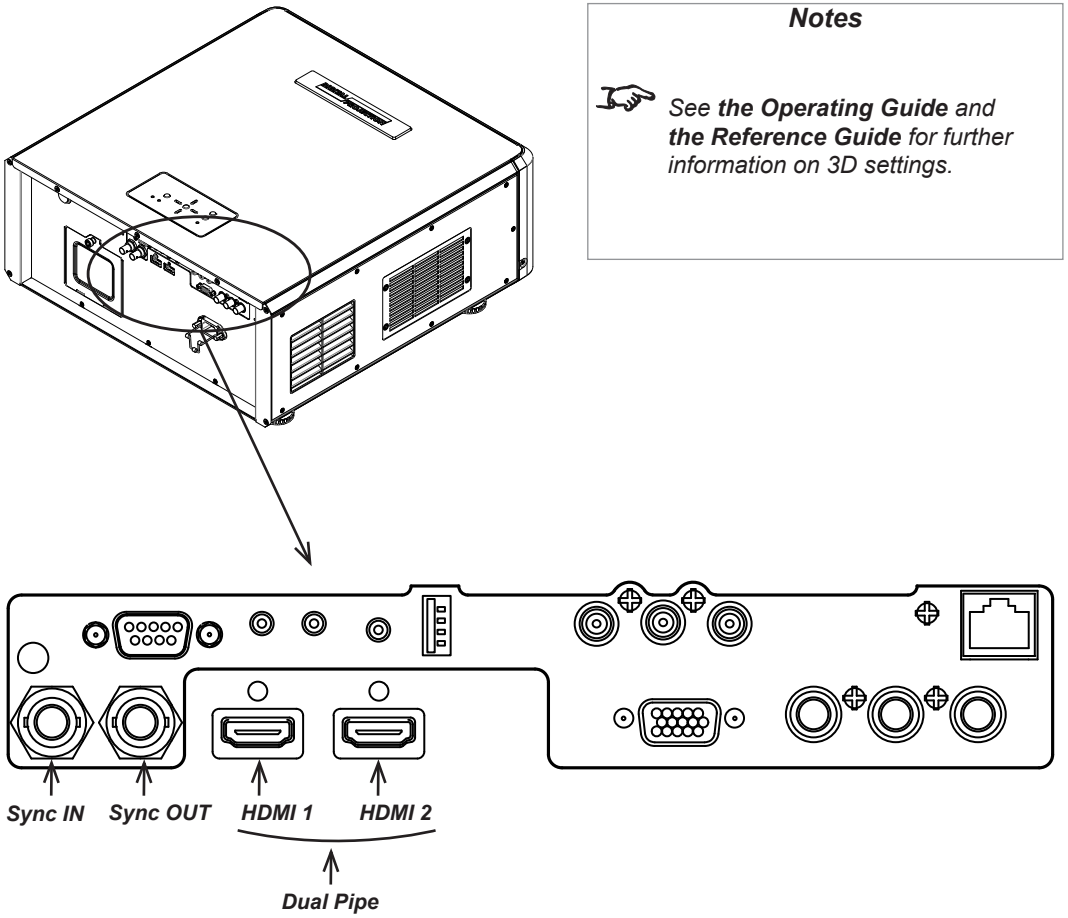
   HDMI 1 is the ***left*** image, and ***HDMI 2*** is the ***right*** image.

3D Sync in

- Sync input signal.

3D Sync out

- Sync output signal. This may be affected by the **Sync Delay** setting in the **3D Control** menu



Notes

*See **the Operating Guide** and **the Reference Guide** for further information on 3D settings.*

Control Connections

USB

The USB port is used to download firmware updates only.

Wired remote

If infrared signals from the remote control cannot reach the projector due to excessive distance or obstructions such as walls or cabinet doors, you can connect an external IR repeater to the remote control input, and position its IR sensor within range of the operator.

RS-232

All of the projector's features can be controlled via a serial connection, using the text strings described in the ***Remote Communications Guide***.

Use a null-modem cable to connect directly to a computer, or a straight cable to connect to a modem.

RJ45

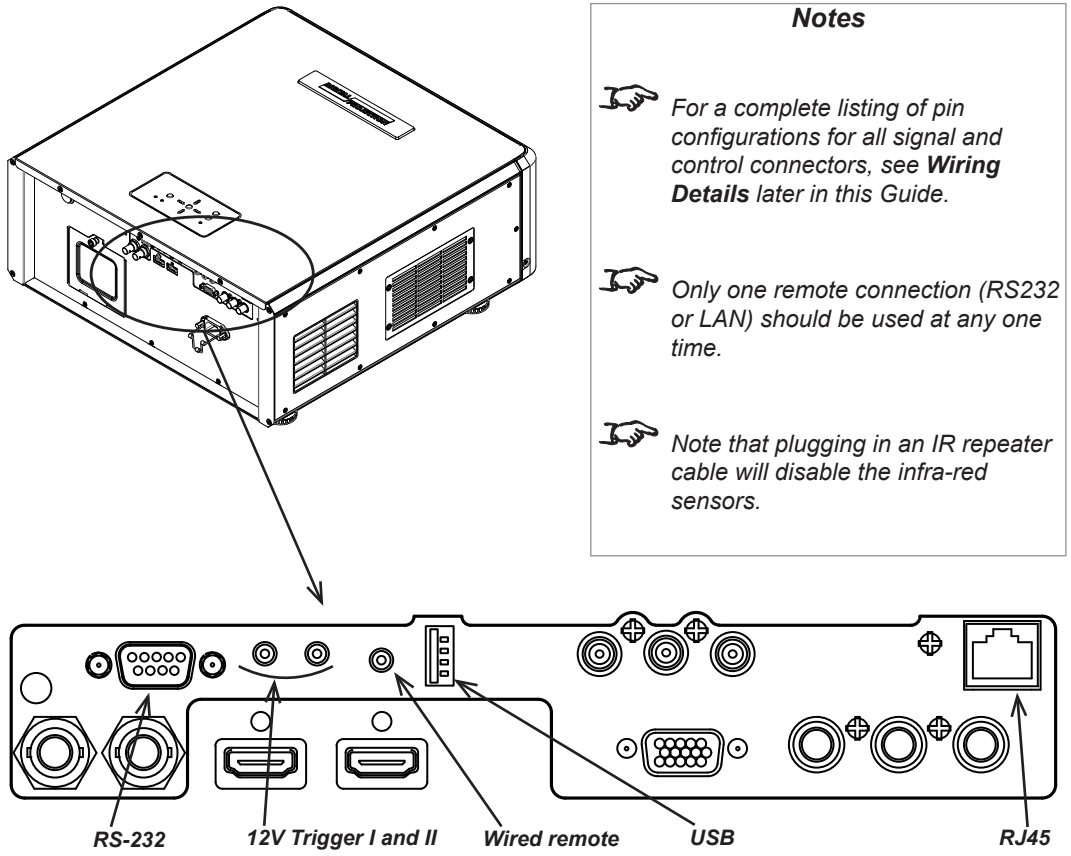
All of the projector's features can be controlled via a LAN connection, using the text strings described in the ***Remote Communications Guide***.

Use a crossed LAN cable to connect directly to a computer, or an uncrossed cable to connect to a network hub.

12V Trigger I and II

These outputs can be used for any of the following purposes, as set in ***the Control menu***:

- Screen: can be connected to an electrically operated screen, automatically deploying the screen when the projector starts up, and retracting the screen when the projector shuts down.
- Aspect ratio: can be used to control screen shuttering for different aspect ratios.
- RS-232: can be used to control the screen or screen shuttering on receipt of an RS-232 command.



Notes

*For a complete listing of pin configurations for all signal and control connectors, see **Wiring Details** later in this Guide.*

Only one remote connection (RS232 or LAN) should be used at any one time.

Note that plugging in an IR repeater cable will disable the infra-red sensors.

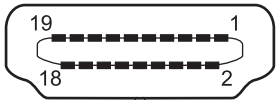
Wiring Details

Signal inputs

HDMI 1 and 2

19 way type A connector

1	TMDS Data 2+
2	TMDS Data 2 Shield
3	TMDS Data 2-
4	TMDS Data 1+
5	TMDS Data 1 Shield
6	TMDS Data 1-
7	TMDS Data 0+
8	TMDS Data 0 Shield
9	TMDS Data 0-
10	TMDS Clock+
11	TMDS Clock Shield
12	TMDS Clock-
13	CEC
14	not connected
15	SCL (DDC Clock)
16	SCA (DDC Data)
17	DDC/CEC Ground
18	+5 V Power
19	Hot Plug Detect



HDMI: pin view of panel connector

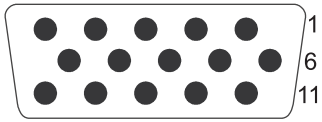
Notes

*For full details of all input settings, see the **Operating Guide**.*

RGB

15 way D-type connector

1	R
2	G
3	B
4	unused
5	Digital Ground (H Sync)
6	R Ground
7	B Ground
8	G Ground
9	+5V
10	Digital Ground (V Sync/DDC)
1	unused
12	SDA
13	H Sync
14	V Sync
15	SCL



VGA: pin view of female connector

Component 1

3 x 75 ohm RCA Phono

	RGsB	**YPbPr**	**YCbCr**
Y/G	G + Sync	Y	Y
Pb/B	B	Pb	Cb
Pr/R	R	Pr	Cr

Component 1 connector

Component 2

3 x 75 ohm BNC

	RGsB	**YPbPr**	**YCbCr**
Y/G	G + Sync	Y	Y
Pb/B	B	Pb	Cb
Pr/R	R	Pr	Cr

Component 2 connector

Notes

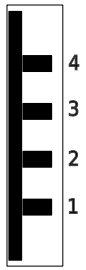
*For full details of all input settings, see the **Operating Guide**.*

Control connections

USB

USB type B socket

Pin 1	VCC (+5 V)
Pin 2	Data−
Pin 3	Data+
Pin 4	Ground

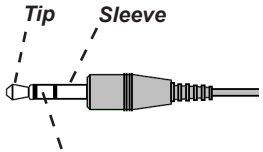


USB port:
pin view of female connector

Wired remote

3.5mm mini jack

Tip	Power
Ring	Signal
Sleeve	Ground



pin view of female connector

RS-232

9 way D-type connector

1 unused

2 Received Data (RX)

3 Transmitted Data (TX)

4 unused

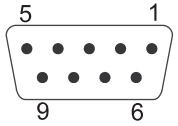
5 Signal Ground

6 unused

7 unused

8 unused

9 unused



RS232:
pin view of female connector

Notes

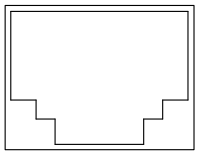
*For full details of all network settings, see the **Operating Guide**.*

Note that plugging in an IR repeater cable will disable the infra-red sensors.

*See the **Remote Communications Guide** for details.*

RJ45

RJ45 socket

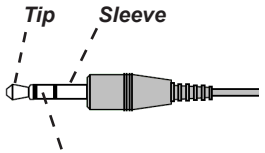


LAN connection

12V Trigger I and II

3.5mm mini jack

Tip	Power
Ring	Signal
Sleeve	Ground



pin view of female connector

Sync IN and Sync OUT

75 ohm BNC

pin view of female connector

Notes

Only one remote connection (RS-232 or RJ45) should be used at any one time.

*See the **Remote Communications Guide** for details.*

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DIGITAL PROJECTION

OPERATING GUIDE

HIGHlite Cine 335 3D Series

High Brightness Digital Video Projector

Rev B March 2013

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Using The Menus

Opening the OSD

Access the various menus using either the projector control panel or the remote control. On either device,

- press the **MENU** button.

The on-screen display (OSD) opens showing the list of available menus.

Opening a menu

Move up and down the list using the **UP**▲ and **DOWN** ▼ arrow buttons.
To open a menu,

- press **ENTER** (on the remote control) or **SELECT** (on the control panel).

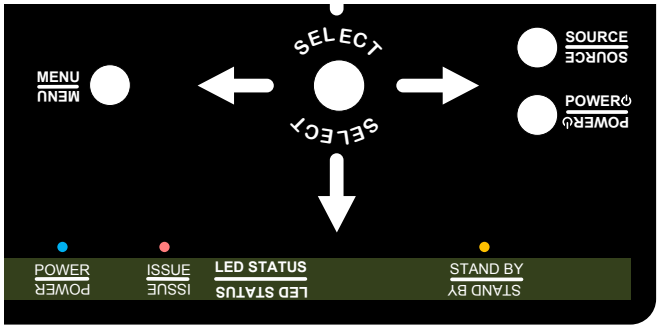
This guide refers to the above two buttons as **ENTER**/**SELECT**.

Exiting menus and closing the OSD

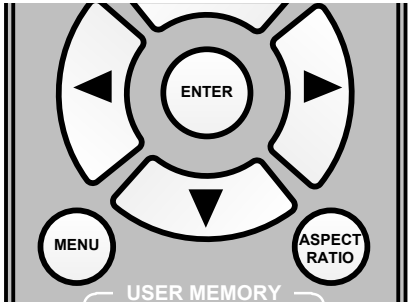
To go back to the previous page,

- press **MENU**.

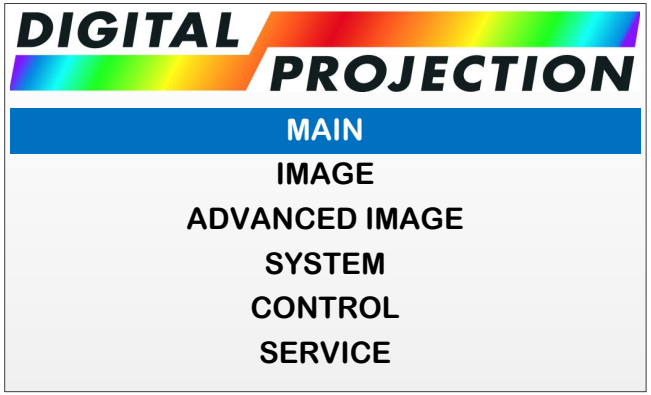
When you reach the top level, pressing **MENU** will close the OSD.



Projector control panel



Remote control



On-screen display: top level (list of available menus)

Notes

Inside a menu

When you open a menu, the page consists of the following elements:

- Title bar at the top
  Shows which menu (and sub-menu) you have accessed.
- Highlighted item
- Available and unavailable items
  Unavailable items appear grayed out. Whether an item is available may depend on other settings.
- Text next to each item
  Shows whether the item:
  - has a value that can be changed (shows the current value)
  - opens a sub-menu (says <Sub-menu>)
  - executes a command (says <Execute>)

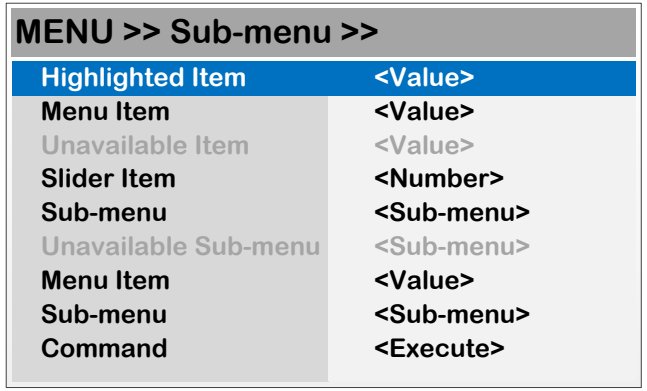
Accessing sub-menus

Use the **UP** ▲ and **DOWN** ▼ arrow buttons to highlight the sub-menu, then press **ENTER**/**SELECT**.

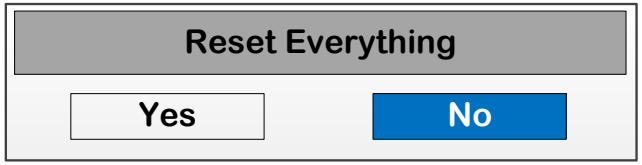
Executing commands

If the item contains a command, press **ENTER**/**SELECT** to execute it.

You may be asked for confirmation. Use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to select your answer and then press **ENTER**/**SELECT**.



Inside a menu



Confirmation dialog

Notes

The highlighted item has a blue background.

Editing projector settings

If the highlighted menu item is a setting with a list of values to choose from, you can change the value in two different ways.

Choosing a value from a list

To access the list of values and then make a selection:

1. Highlight the menu item and press **ENTER**/**SELECT**.
2. On the new page that opens, use the **UP** ▲ and **DOWN** ▼ arrow buttons to highlight a value, then press **ENTER**/**SELECT** again. A green "check" symbol ✔ marks the current selection.
3. Press **MENU** to exit the list.

Changing the value without viewing the list

To switch to the next or previous value without viewing the list,

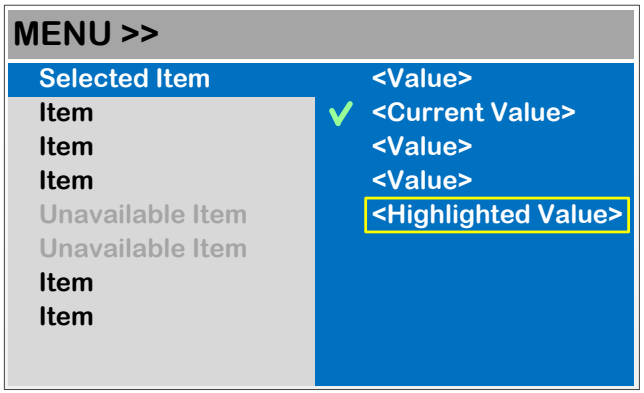
- press the **LEFT** ◀ or **RIGHT** ▶ arrow button.

Using a slider to set a value

Some parameters with a numeric value open a slider. To set such a parameter:

1. Press the **LEFT** ◀ or **RIGHT** ▶ arrow button, or **ENTER**/**SELECT**. The arrow buttons will open the slider and adjust the value at the same time. **ENTER**/**SELECT** will open the slider without altering the initial value.
2. Use the LEFT ◀ and RIGHT ▶ arrow buttons to move the slider.

When ready, press MENU to exit the slider.



List of values

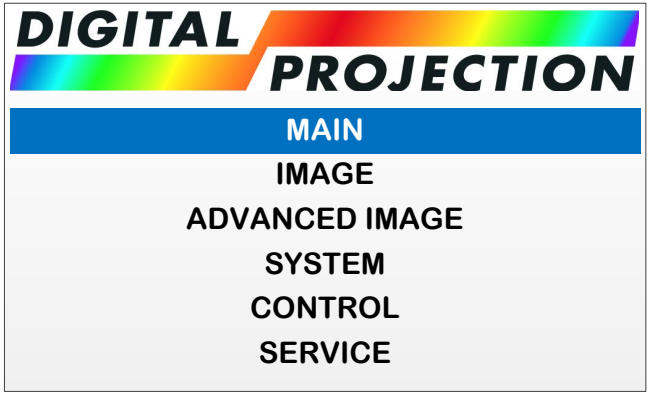
Slider

Notes

Some menu items may not be available due to settings in other menus. These will be grayed out on the actual menu.

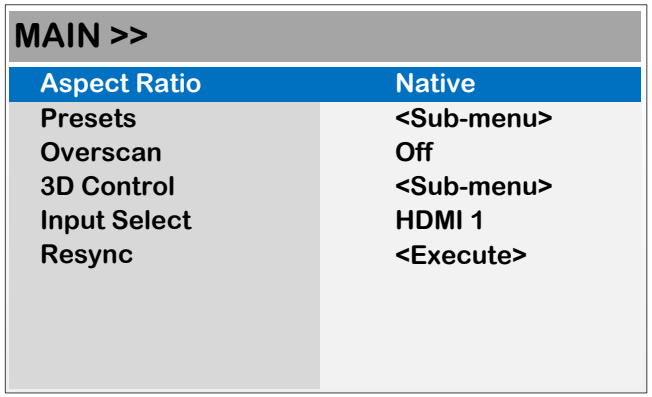
A Tour Of The Menus

The projector settings are grouped into six menus as shown in the illustration.



Main menu

Selecting **Main** from the top level opens the **Main** menu.



Main Menu

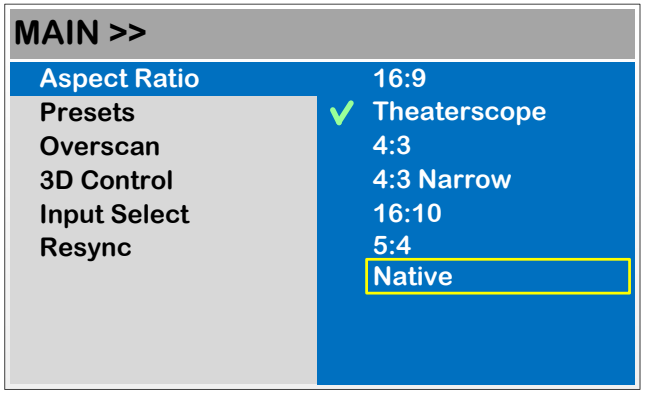
Notes

*See also **Using the Menus** earlier in this guide and **Menu Map** later in this guide.*

Main menu continued from previous page

Aspect Ratio

Choose between **16:9**, **Theaterscope**, **4:3**, **4:3 Narrow**, **16:10**, **5:4** and **Native**.



Notes

Main Menu
Aspect Ratio

*An **anamorphic lens** (optional accessory) is used with the **TheaterScope** setting, to ensure that for a **2.35:1** image, the maximum area of the DMD is used, giving maximum image brightness.*

*The **4:3 Narrow** setting is used to compensate for the distortion that an anamorphic lens would cause to a 4:3 image.*

*For examples of how the different aspect ratios affect screen dimensions, see **Aspect Ratios Explained** in the **Reference Guide**.*

Main menu continued from previous page

Presets

The current image settings can be saved a preset, which you can recall later. The default settings can be recalled at any time as well.

Up to four custom presets can be stored for each input source you use.

The following settings are saved in a preset:

- From the **Main** menu — **Aspect Ratio** and **Overscan**
- From the **Image** menu — **Brightness**, **Contrast**, **Saturation**, **Hue**, **Sharpness** and **Noise Reduction**
- From the **Advanced Image** menu — **Colorspace**, **Gamma**, **Color Temperature**, **Color Gamut**, **Dynamic Black**, **Adaptive Contrast**, **RGB Offsets** and **RGB Gains**.

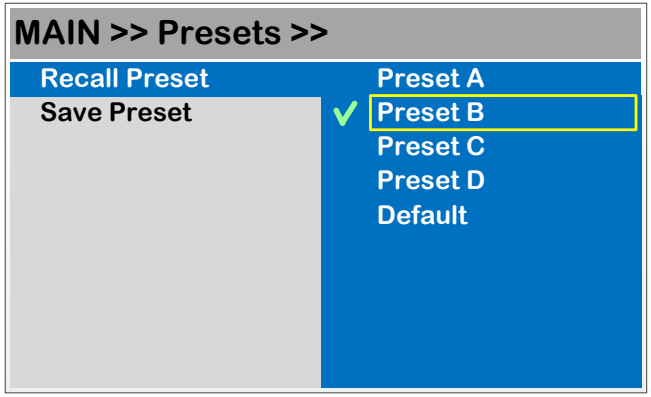
To save a preset:

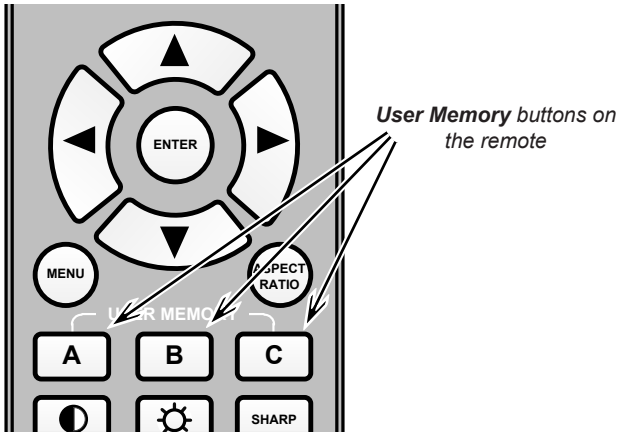
1. From the **Main** menu, open **Presets**.
2. Highlight **Save Preset** on the left and then move to the list on the right. Select the preset you wish to save and press **ENTER**/**SELECT**.

To recall a saved preset:

1. From the **Main** menu, open **Presets**.
2. Highlight **Recall Preset** on the left and move to the list on the right. Select the preset you wish to recall, then press **ENTER**/**SELECT**.

Press MENU to leave the **Presets** page.





***User Memory** buttons on the remote*

Notes

Main Menu
Presets

Settings are saved ONLY for the current input source.

*Preset D is only accessible through the **Presets** page of the menu or via a protocol command, and not through the remote.*

*For information on protocol commands, see the **Remote Communications Guide**.*

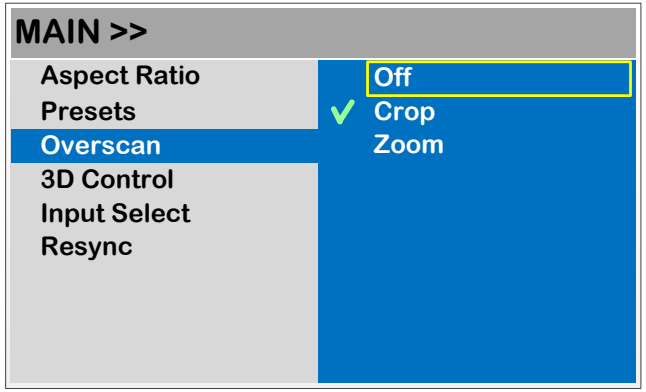
Main menu continued from previous page

Overscan

This setting, if switched on, removes unwanted artefacts from the edges of your image by cropping the edges or increasing the size of the image to force the edges off-screen.

Unwanted artefacts along the image edges usually occur when the projector is connected to a low quality input souce.

Choose from **Off**, **Crop** or **Zoom**.



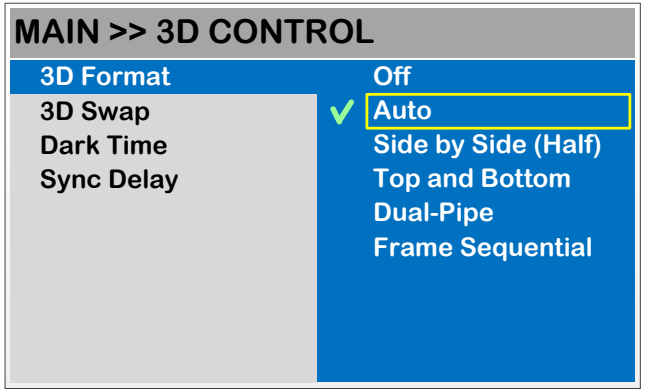
Notes

Main Menu
Overscan

3D Control

Use this sub-menu to enable, disable and set up 3D input, as follows:

- **3D Format** — **Off**, **Auto**, **Side by Side (Half)**, **Top and Bottom**, **Dual-Pipe, Frame Sequential**.
- **3D Swap** — **Normal** and **Reverse** (set to **Reverse** if the 3D images are displayed in the wrong order)
- **Dark Time** — **0.65 ms**, **1.3 ms**, **1.9 ms** and **2.5 ms**. Set to reduce the effect of images overlapping whilst the glasses are switching
- **Sync Delay** — set to compensate for signal processsing delays in the projector.



Notes

Main Menu
3D Control

3D video is only possible on the HDMI inputs.

*Set **3D Format** to **Auto** to display the Frame Packing format.*

*Set the **Dark Time** to the value appropriate to the glasses or ZScreen.*

1.9 ms and 2.5 ms Dark Time settings are unavailable when 3D content is displayed at 144Hz.

*Adjust the **Sync Delay** to eliminate ghosting and achieve a smooth grayscale.*

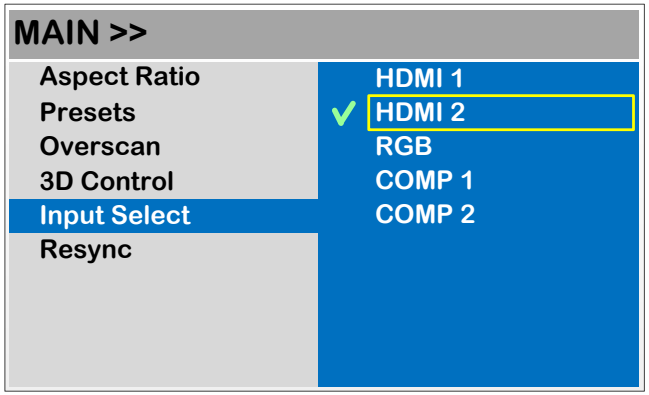
*For additional information on 3D settings and a list of supported 3D formats, see the **Reference Guide**.*

Main menu continued from previous page

Input Select

This setting controls the input source used by the projector. Choose from the following input sources:

- **HDMI 1**
- **HDMI 2**
- **RGB**
- **COMP 1**
- **COMP 2**



Resync

Press **ENTER/SELECT** to force the projector to resynchronize with the current input signal.

Notes

Main Menu
Input Select

*See the **Connection Guide** for further information about the available inputs and connections.*

You can also select an input source by pressing the buttons 1 to 5 on the remote control.

*Alternatively, press the **SOURCE** button on the control panel to cycle through the inputs.*

*If **Auto-Source** is enabled, the projector will automatically search for an active input source. See **Control menu** further in this guide.*

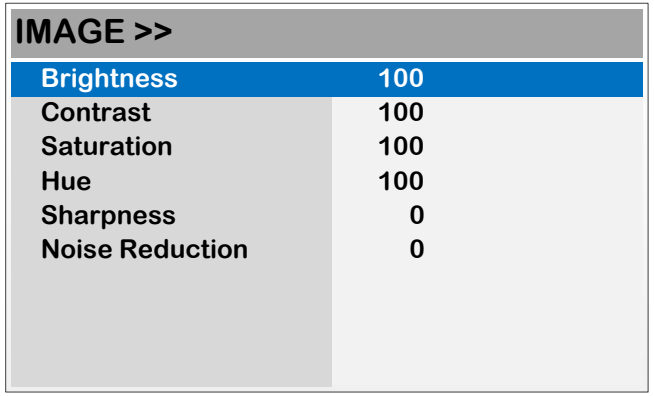
Main Menu
Resync

Image menu

Highlight the setting you wish to edit, and then press **ENTER/SELECT**, or the **LEFT** ◀ or **RIGHT** ▶ arrow button to open the slider.

Use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to adjust the slider.

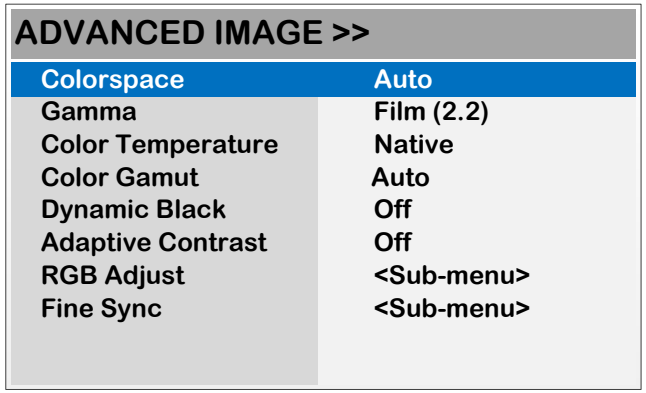
Press **MENU** to close the slider.



Notes

Image Menu

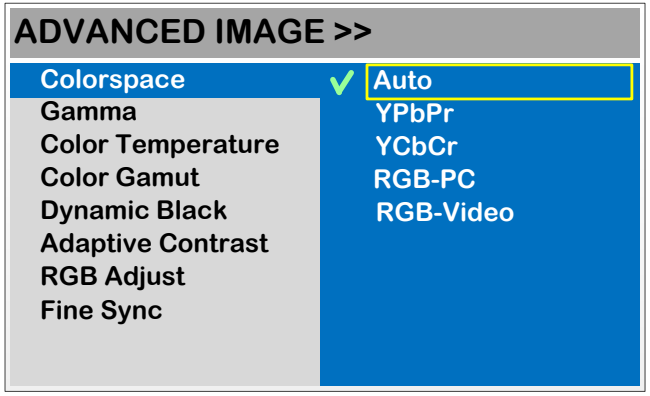
Advanced Image menu



Colorspace

In most cases, the **Auto** setting determines the correct colorspace to use. If it does not, you can choose a specific colorspace:

- **YPbPr** sets the colorspace to that defined in ITU-R BT.709. Use for high definition video sources.
- **YCbCr** sets the colorspace to that defined in ITU-R BT.601. Use for standard definition video sources.
- **RGB-PC** uses RGB colorspace and sets black at 0 and white at 255. Known as Full Range.
- **RGB-Video** uses RGB colorspace and sets black at 16 and white at 235. Known as Limited Range.



Highlight the setting you wish to edit, and then either press **ENTER/SELECT** to access it, or use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to switch between values.

Press **MENU** to go back.

Notes

Advanced Image Menu

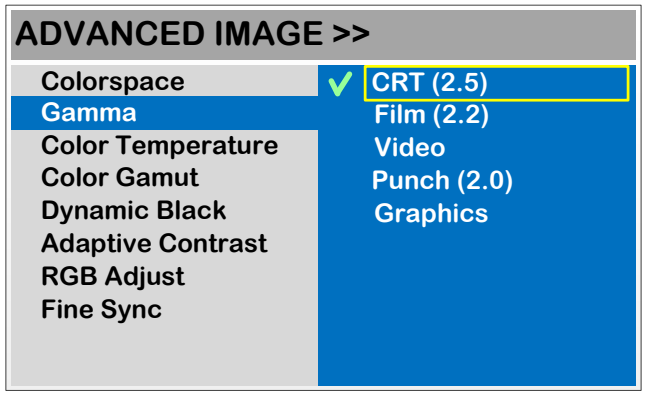
Advanced Image Menu
Colorspace

Gamma

Choose a de-gamma curve from **CRT (2.5)**, **Film (2.2)**, **Video**, **Punch (2.0)** and **Graphics**.

Used correctly, the **Gamma** setting can improve contrast while maintaining good details for blacks and whites.

If excess ambient light washes out the image and it is difficult to see details in dark areas, lower the **Gamma** setting to compensate. This improves contrast while maintaining good details for blacks. Conversely, if the image is washed out and unnatural, with excessive detail in black areas, increase the setting.

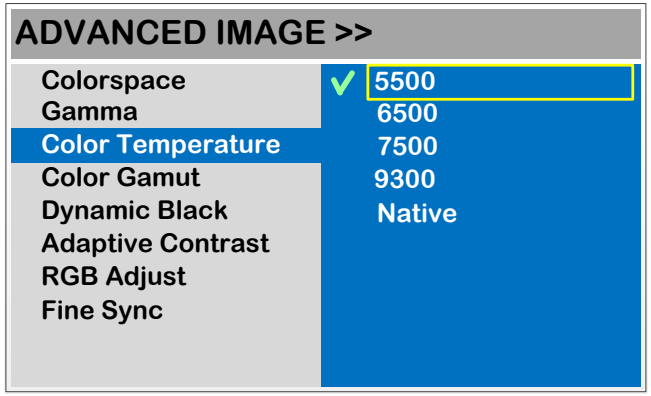


Color Temperature

Choose a value from **5500** (warmer) to **9300** (cooler) or **Native** (no correction).

Highlight the setting you wish to edit, and then either press **ENTER/SELECT** to access it, or use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to switch between values.

Press **MENU** to go back.



Notes

Advanced Image Menu
Gamma

***Video** is similar to **Film (2.2)** but improves dark areas of the image — especially suitable for images from video cameras.*

***Graphics** should only be used for computer presentations that require increased brightness at the cost of grayscale accuracy.*

Advanced Image Menu
Color Temperature

***Color Temperature** is unavailable when the projector is in 3D mode.*

Advanced Image menu continued from previous page

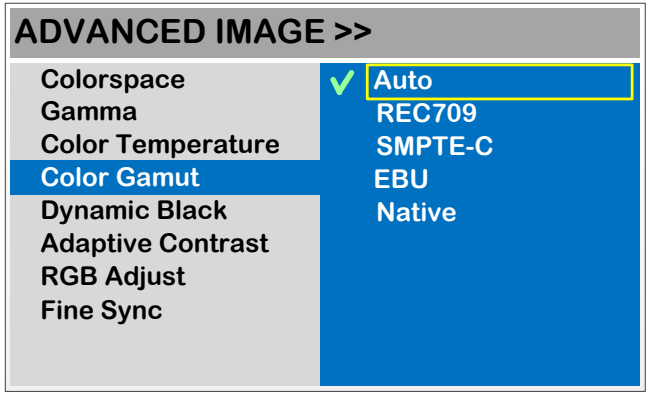
Color Gamut

In most cases, the **Auto** setting will determine the correct color gamut to use. If it does not, you can select the appropriate setting manually.

Each setting defines the precise hue of each primary (red, green and blue) and secondary (yellow, cyan and magenta) color component used to generate the image.

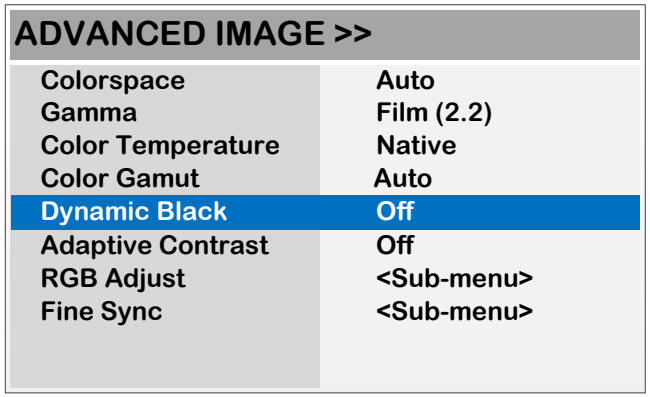
Use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to select from:

- **Auto**
- **REC709** for high definition sources
- **SMPTE-C** for NTSC, 480i and 480p sources
- **EBU** for PAL, SECAM, 576i and 576p sources
- **Native** — no correction



Dynamic Black

Allows for increased contrast in darker scenes by modulating the light source.



Highlight the setting you wish to edit, and then either press **ENTER/SELECT** to access it, or use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to switch between values.

Press **MENU** to go back.

Notes

Advanced Image Menu
Color Gamut

__Color Gamut__ is unavailable when the projector is in 3D mode.

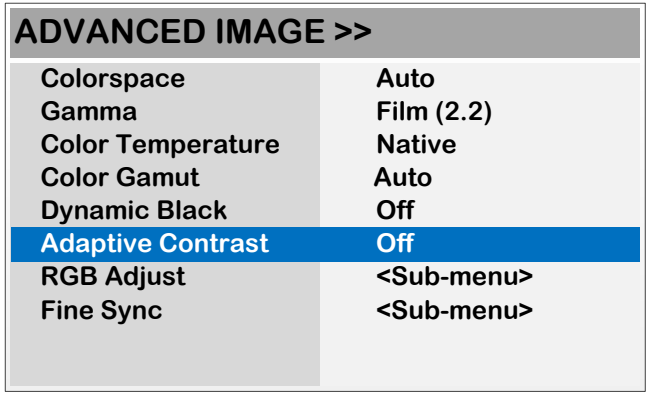
Advanced Image Menu
Dynamic Black

It is best to turn the __Dynamic Black__ setting Off before adjusting the brightness, contrast or image quality settings.

Advanced Image menu continued from previous page

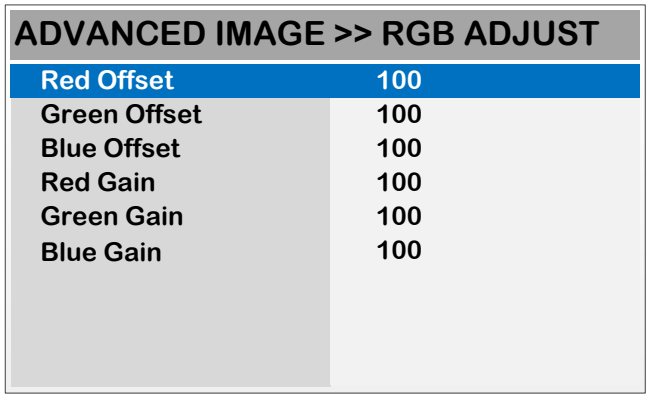
Adaptive Contrast

Expands the light and dark portions of the contrast curve of the image, depending on the mean luminance of the image.



RGB Adjust

Adjust the RGB offset and gain settings to improve the color balance of the projected image.



Highlight the setting you wish to edit, and then either press **ENTER/SELECT** to access it, or use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to switch between values.

Press **MENU** to go back.

Notes

Advanced Image Menu
Adaptive Contrast

Advanced Image Menu
RGB Adjust

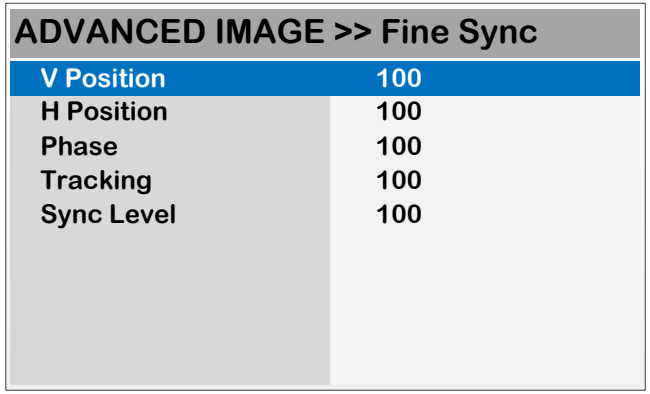
Advanced Image menu continued from previous page

Fine Sync

- **V Position** and **H Position**
  Set the sliders as required.
- **Phase**
  Adjusts the phase of the pixel sampling clock relative to the incoming signal. Adjust the phase if noise is visible.
- **Tracking**
  Adjusts the frequency of the pixel sampling clock. Flicker or vertical banding indicate poor tracking.
- **Sync Level**
  Adjusts the voltage level of the signal detection circuitry. Adjust if the projector loses sync during scenes where the signal drops below black.

Highlight the Fine Sync setting, and then either press **ENTER/SELECT** to access it, or use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to switch between values.

Press **MENU** to go back.



Notes

Advanced Image Menu
Fine Sync

*Some of the settings within the **Fine Sync** sub-menu, **Phase**, **Tracking** and **Sync Level**, affect only RGB and Component input sources. These settings are not available if the projector is using a different source.*

*Adjust the **Phase** after adjusting **Tracking**.*

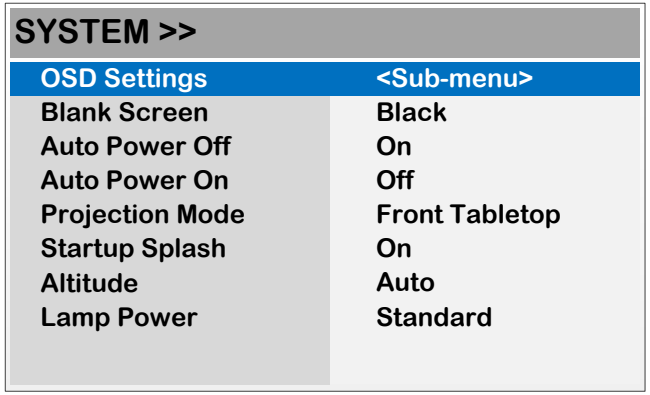
System menu

This menu contains the following settings:

- **OSD Settings**
  Controls the positioning and behavior of the OSD.
- **Blank Screen**
  Defines what appears on the screen while the projector is running with no input signal.
- **Auto Power Off**
  Set this to **On** if you want the projector to go into STANDBY mode when no input source is detected for 20 minutes.
- **Auto Power On**
  If this is **On**, the projector will start up as soon as the mains is connected. If **Off**, the projector will go into STANDBY mode.
- **Projection Mode**
  Tabletop is for a unit standing on its feet; set to **Ceiling** if the projector is mounted upside down. **Front** and **Rear** define whether the projector is in front of the screen or behind it.
- **Startup Splash**
  Show or hide the Digital Projection logo at startup.
- **Altitude**
  High increases the fan speed to compensate for reduced air density at high altitude.
- **Lamp Power**
  Choose between higher brightness and longer lamp life. Set this to **Economy** to run the lamp at reduced power.

Highlight the setting you wish to edit, and then either press **ENTER/SELECT** to access it, or use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to switch between values.

Press **MENU** to go back.



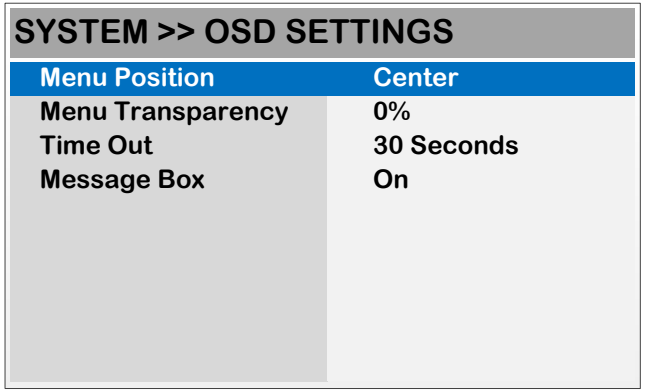
Notes

System Menu

OSD Settings

This menu contains the following settings:

- **Menu Position** determines where the OSD should appear on the screen when activated.
- **Menu Transparency**.
- **Time Out** determines how long the OSD should remain on the screen if no buttons are pressed. Choose **Always On** to disable this feature.
- **Message Box** determines whether projector status messages should appear on the screen.

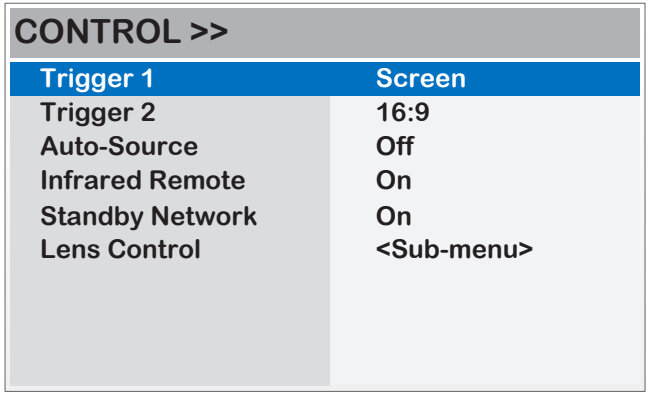


Notes

System Menu
OSD Settings

Control menu

- **Triggers**
  Choose from **Screen**, **16:9**, **Theaterscope**, **4:3**, **4:3 Narrow** or **RS232** to determine what will cause each trigger output to activate.
- **Auto-Source**
  If this setting is **On**, the projector will automatically search for an active input source.
- **Infrared Remote**
  Switch the remote control sensors on and off.
- **Standby Network**
  If this setting is **On**, the RJ45 socket remains active when the projector is in STANDBY mode. If the setting is **Off**, the RJ45 socket is disabled when the projector is in STANDBY mode.
- **Lens Control**
  Adjust **Focus**, **Zoom** and **Lens Shift**.



Service menu

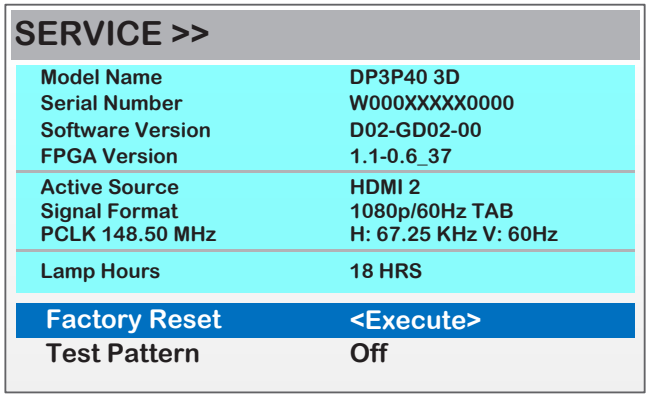
Factory Reset

To restore the factory default settings:

1. Navigate to **Factory Reset** and press **ENTER/SELECT**.
2. When prompted, use the **LEFT** ◀ and **RIGHT** ▶ arrow buttons to highlight the **Yes** button and then press **ENTER/SELECT** to confirm your choice.

Test Pattern

Highlight this setting and then use the **LEFT** ◀ **and RIGHT** ▶ arrow buttons to switch between the various patterns.



Notes

Control Menu

The projector consumes less power when **Standby Network** *is set to* **Off**.

Service Menu

Test Pattern *is unavailable when the projector is in 3D mode.*

Menu Map

Menu | ***Sub-menus and settings***

MAIN

Aspect Ratio *16:9, Theaterscope, 4:3, 4:3 Narrow, 16:10, 5:4, Native*

Presets

Recall A, B, C, D, Default
Save A,, B, C, D

Overscan *Off, Crop, Zoom*

3D Control

3D Format *Off, Auto, Side by Side (Half), Top and Bottom, Dual-Pipe, Frame Sequential*
3D Swap *Normal, Reverse*
Dark Time *0.65 ms, 1.3 ms, 1.95 ms, 2.5 ms*
Sync Delay *value between -3.0 ms and 3.0 ms (0.0 ms)*

Input Select *HDMI 1, HDMI 2, RGB, COMP 1, COMP 2*

Resync *executable command*

IMAGE

Brightness *value between 0 and 200 (100)*

Contrast *value between 0 and 200 (100)*

Saturation *value between 0 and 200 (100)*

Hue *value between 0 and 200 (100)*

Sharpness *value between 0 and 200 (0)*

Noise Reduction *value between 0 and 200 (0)*

Notes

Some of the information in this menu map is summarised. See the actual menu on the projector for full detail.

The underlined text represents the factory default value for each setting.

The default value of a slider is given in brackets next to the setting.

Menu	*Sub-menus and settings*
ADVANCED IMAGE	
	Colorspace *Auto, YPbPr, YCbCr, RGB PC, RGB Video*
	Gamma *CRT (2.5), Film (2.2), Video, Punch (2.0), Graphics*
	Color Temperature *5500, 6500, 7500, 9300, Native*
	Color Gamut *Auto, REC709, SMPTE-C, EBU, Native*
	Dynamic Black *Off, On*
	Adaptive Contrast *Off, On*
	RGB Adjust
	Red Offset *value between 0 and 200 (100)*
	Green Offset *value between 0 and 200 (100)*
	Blue Offset *value between 0 and 200 (100)*
	Red Gain *value between 0 and 200 (100)*
	Green Gain *value between 0 and 200 (100)*
	Blue Gain *value between 0 and 200 (100)*
	Fine Sync
	V Position *value between 0 and 200 (100)*
	H Position *value between 0 and 200 (100)*
	Phase *value between 0 and 200 (100)*
	Tracking *value between 0 and 200 (100)*
	Sync Level *value between 0 and 200 (100)*

Notes

Some of the information in this menu map is summarised. See the actual menu on the projector for full detail.

The underlined text represents the factory default value for each setting.

The default value of a slider is given in brackets next to the setting.

Menu	*Sub-menus and settings*
SYSTEM	
	OSD Settings
	Menu Position *Left-Upper, Right-Upper, Left-Bottom, Right-Bottom, <u>Center</u>*
	Menu Transparency *<u>0%</u>, 25%, 50%, 75%*
	Time Out *Always On, 10 sec, <u>30 sec</u>, 60 sec*
	Message Box *Off, <u>On</u>*
	Blank Screen *Splash, <u>Black</u>, Blue, White*
	Auto Power Off *<u>Off</u>, On)*
	Auto Power On *<u>Off</u>, On)*
	Projection Mode *<u>Front Tabletop</u>, Front Ceiling, Rear Tabletop, Rear Ceiling*
	Startup Splash *Off, <u>On</u>*
	Altitude *High, <u>Auto</u>*
	Lamp Power *Economy, <u>Standard</u>*
CONTROL	
	Trigger 1 *<u>Screen</u>, 16:9, Theaterscope, 4:3, 4:3 Narrow, RS232*
	Trigger 2 *Screen, <u>16:9</u>, Theaterscope, 4:3, 4:3 Narrow, RS232*
	Auto-Source *<u>Off</u>, On*
	Infrared Remote *Off, <u>On</u>*
	Standby Network *Off, <u>On</u>*
	Lens Control
	Focus *adjust*
	Zoom *adjust*
	Lens Shift *adjust horizontal and vertical*
SERVICE	
	Information
	Model Name, Serial Number, Software Version, FPGA Version
	Active Source, Signal Format, PCLK
	Lamp Hours
	Factory Reset *(Projector will ask for confirmation before restoring factory default settings.)*
	Test Patterns *<u>Off</u>, White, Black, Red, Green, Blue, Cyan, Magenta, Yellow, Chequer Board, Alignment Grid, Vertical Burst, Horizontal Burst, Color Bars*

Notes

Some of the information in this menu map is summarised. See the actual menu on the projector for full detail.

The <u>underlined text</u> represents the factory default value for each setting.

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DIGITAL PROJECTION

REMOTE COMMUNICATIONS GUIDE

HIGHlite Cine 335 3D Series

High Brightness Digital Video Projector

Rev B March 2013

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Introduction

The projector can be controlled by using an external control system or a PC via an RS232 or LAN interface, using a terminal-emulation program, such as HyperTerminal.

Operation commands are used to simulate menu operations and determine the settings of the projector, and use the following format:

- All commands consist of ASCII text strings starting with the letters 'op', and ending with an ASCII Carriage Return character:
  `op <operation> <command> [CR]`
- The <operation> string determines which setting the command will affect. For example, "aspect" stands for aspect ratio.
- The <command> string can take one of the following formats:

Command	<command>	Description
Set	`= <value>`	Makes the setting take that value.
Get	`?`	Asks what the current value is. The value is returned as an ASCII text string.
Increment	`+`	Adds 1 to the current value.
Decrement	`–`	Subtracts 1 from the current value.
Execute	(none)	Performs an action.

Examples

`op aspect = 1 [CR]` sets the aspect ratio to TheaterScope.

`op aspect ? [CR]` asks what is the current aspect ratio.

`op bright + [CR]` increments the brightness setting.

`op contrast – [CR]` decrements the contrast setting.

`op resync [CR]` commands the projector to attempt to re-synchronise to the current input source.

Notes

The Serial Port settings are:

- *Baud rate - 9,600 bps*
- *Data length - 8 bits*
- *Stop bits - one*
- *Parity - none*
- *Flow control - none*

The default IP is 192.168.0.100 and the TCP port number is 7000.
*The IP address can be changed - see **IP Configuration Utility** later in this guide.*

Spaces in commands are necessary, therefore:

- `op aspect = 1` *is correct;*
- `opaspect=1` *is incorrect.*

The Operation Commands

<operation>	<command>	<values>
Main menu		
aspect	= ?	0 = 16:9 1 = TheaterScope 2 = 4:3 3 = 4:3 Narrow 4 = 16:10 5 = 5:4 6 = Native
recall.mem	= ?	0 = Preset A 1 = Preset B 2 = Preset C 3 = Preset D 4 = Default
save.mem	=	0 = Preset A 1 = Preset B 2 = Preset C 3 = Preset D
overscan	= ?	0 = Off 1 = Crop 2 = Zoom
s3d.inputtype	= ?	0 = Off 1 = Auto 2 = Side by Side (Half) 3 = Top and Bottom 4 = Dual-Pipe 5 = Frame Sequential
s3d.chswap	= ?	0 = Normal 1 = Swap
s3d.darktime	= ?	0 = 0.65 ms 1 = 1.3 ms 2 = 1.95 ms 3 = 2.5 ms

continued on next page...

Notes

If the projector is in **Side by Side (Half)** *3D mode and you intend to switch to* **Frame Sequential**, *you MUST first switch back to 2D and then switch to the other 3D mode.*

<operation>	<command>	<values>
s3d.syncdelay	= ?	0 - 60
input	= ?	0 = HDMI 1 1 = HDMI 2 2 = RGB 3 = Component 1 4 = Component 2
resync	(none)	(none)
Image menu		
brightness	= ? + -	0 - 200
contrast	= ? + -	0 - 200
saturation	= ? + -	0 - 200
hue	= ? + -	0 - 200
sharpness	= ? + -	0 - 200
nr	= ? + -	0 - 200
Advanced Image menu		
color.space	= ?	0 = Auto 1 = YPbPr 2 = YCbCr 3 = RGB-PC 4 = RGB-Video
gamma	= ?	0 = CRT 1 = Film 2 = Video 3 = Punch 4 = Graphics
color.temp	= ?	0 = 5500K 1 = 6500K 2 = 7500K 3 = 9300K 4 = Native

continued on next page...

Notes

The numeric value assigned to s3d.syncdelay *corresponds to a delay in milliseconds between -3 and 3 ms. For example, 0 = -3 ms, 30 = 0 ms and 60 = 3ms.*
To work out the sync delay time, use the following formula:
SyncDelay = <value> x 0.1 - 3.

<operation>	<command>	<values>
color.gamut	= ?	0 = Auto 1 = REC709 2 = SMPTE C 3 = EBU 4 = Native
db	= ?	0 = Off 1 = On
adcontrast	= ?	0 = Off 1 = On
red.offset	= ? + -	0 - 200
green.offset	= ? + -	0 - 200
blue.offset	= ? + -	0 - 200
red.gain	= ? + -	0 - 200
green.gain	= ? + -	0 - 200
blue.gain	= ? + -	0 - 200
vert.pos	= ? + -	0 - 200
hori.pos	= ? + -	0 - 200
phase	= ? + -	0 - 200
tracking	= ? + -	0 - 200
sync.level	= ? + -	0 - 200
System menu		
osd.menupos	= ?	0 = Left Upper 1 = Right Upper 2 = Left Bottom 3 = Right Bottom 4 = Center
osd.trans	= ?	0 = 0% 1 = 25% 2 = 50% 3 = 75%

continued on next page...

Notes

☞ db *controls Dynamic Black*

☞ adcontrast *controls Adaptive Contrast*

<operation>	<command>	<values>
osd.timer	= ?	0 = Always On 1 = Display OSD for 10 sec. 2 = Display OSD for 30 sec. 3 = Display OSD for 60 sec.
osd.msgbox	= ?	0 = Off 1 = On
blank.screen	= ?	0 = Logo 1 = Black 2 = Blue 3 = White
auto.poweroff	= ?	0 = Off 1 = On
auto.poweron	= ?	0 = Off 1 = On
proj.mode	= ?	0 = Front Tabletop 1 = Front Ceiling 2 = Rear Tabletop 3 = Rear Ceiling
logo.disp	= ?	0 = disable 1 = enable
altitude	= ?	0 = Auto 1 = High
lamp.pow	= ?	0 = Standard 1 = Economy
Control menu		
trig1	= ?	0 = Screen 1 = 16:9 2 = TheaterScope 3 = 4:3 4 = 4:3 Narrow 5 = RS232 mode 6 = RS232 On 7 = RS232 Off

continued on next page...

Notes

☞ logo.disp *controls Splash Screen*

☞ *0: Trigger occurs when the projector is in IMAGING mode.*

☞ *6 (RS232 On) and 7 (RS232 Off) can only be set if you send a value of 5 (RS232 mode) in advance.*

<operation>	<command>	<values>
trig2	= ?	0 = Screen 1 = 16:9 2 = TheaterScope 3 = 4:3 4 = 4:3 Narrow 5 = RS232 mode 6 = RS232 On 7 = RS232 Off
auto.source	= ?	0 = Off 1 = On
ir.enable	= ?	0 = Disable 1 = Enable
net.en	= ?	0 = Disable 1 = Enable
horiz.offset	+ -	(none)
vert.offset	+ -	(none)
focus	+ -	(none)
zoomin	+ -	(none)
Service menu		
model.name	?	<string>
ser.number	?	<string>
soft.version	?	<string>
act.source	?	0 = HDMI 1 1 = HDMI 2 2 = RGB 3 = Component 1 4 = Component 2
signal	?	<string>
pixel.clock	?	<number>
h.refresh	?	<number>
v.refresh	?	<number>
lamp.hours	?	<number>
total.hours	?	<number>

continued on next page...

Notes

0: Trigger occurs when the projector is in IMAGING mode.

6 (RS232 On) and 7 (RS232 Off) can only be set if you send a value of 5 (RS232 mode) in advance.

`ir.enable` *controls the IR sensors*

`net.en` *controls Standby Network*

`horiz.offset` *controls horizontal lens shift.*

`vert.offset` *controls vertical lens shift.*

`act.source` *returns the active input source*

<operation>	<command>	<values>
factory.reset	(none)	(none)
pattern	= ?	0 = Off 1 = White 2 = Black 3 = Red 4 = Green 5 = Blue 6 = Cyan 7 = Magenta 8 = Yellow 9 = Chequer Board 10 = Alignment Grid 11 = Vertical Burst 12 = Horizontal Burst 13 = Color Bars
Miscellaneous commands		
blue.only	=	0 = Off 1 = On
powon	(none)	(none)
powoff	(none)	(none)
status.check	?	0 = standby 1 = warm up 2 = imaging 3 = cooling 4 = error
net.ipaddr	?	<string>

Notes

☞ powon *and* powoff *stand for Power On and Power Off respectively. Power Off puts the projector into STANDBY mode.*

☞ *When using the* powon *command over a LAN connection, ensure the* ***Standby Network*** *setting is* ***On****.*

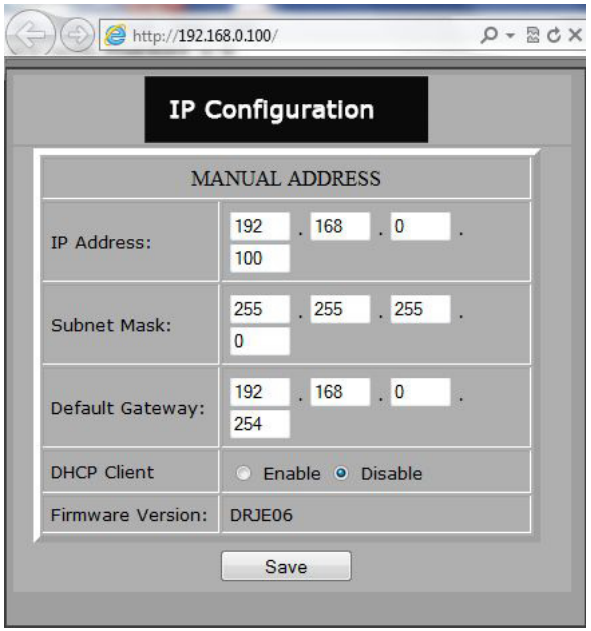
☞ net.ipaddr *returns the IP address of the projector.*

IP Configuration Utility

The IP Configuration utility can be used to change the IP Address, Subnet and Gateway. DHCP can also be switched on or off.

To access the IP Configuration utility,

- Type the URL http://<LAN IP Address> into the address bar of your browser, then press **ENTER**.
  The embedded web page shown on the right should appear.



Notes

The default LAN IP address is 192.168.0.100
You can use the `net.ipaddr` *command to obtain the current IP address.*

Make a note of any new settings. You will need them to reconnect to the projector.

DIGITAL PROJECTION

REFERENCE GUIDE

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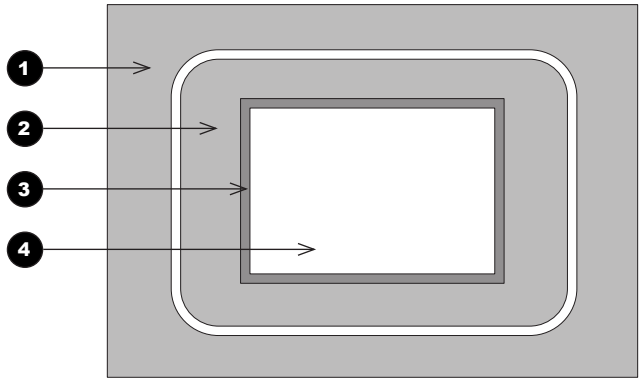
The DMD™

A DMD™ (Digital Micromirror Device™) is a true digital light modulator which utilises an array of up to 2.3 million moving aluminium mirrors, with each one representing a pixel in the final projected image. The outermost micromirrors in the array remain inactive and are not used in constructing the image.

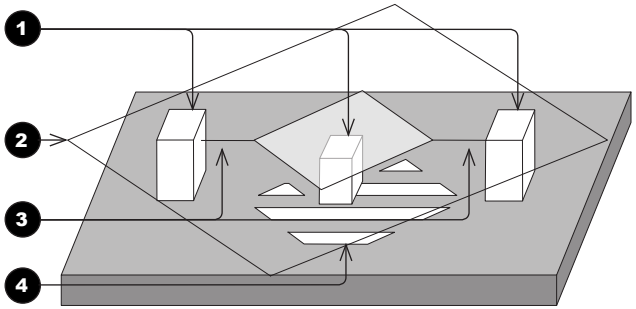
1. **Casing**
2. **Light shield**
3. **Inactive mirrors**
4. **Array**



DMD

Each mirror element is suspended over address electrodes by a torsion hinge between two posts.

1. **Support posts**
2. **Mirror element**
3. **Torsion hinges**
4. **Offset address electrode**



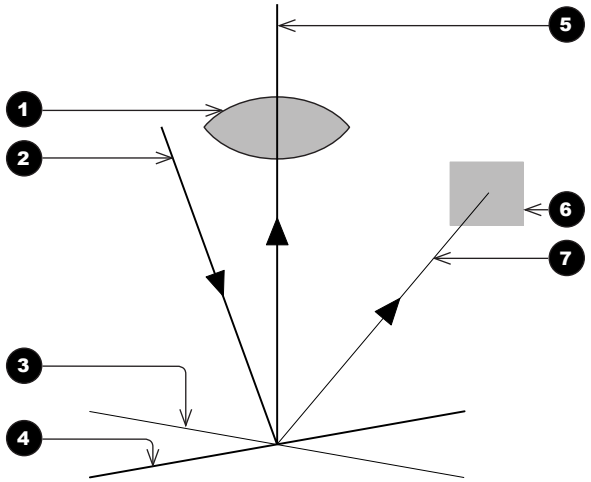
Mirror element with tilt mechanism

Notes

The DMD™ (continued)

Depending on the voltage polarity applied, each mirror will either tilt to the left to produce a bright pixel or to the right for a dark pixel. When light is applied to the complete DMD™, only the light redirected from a mirror tilting to the left is projected.

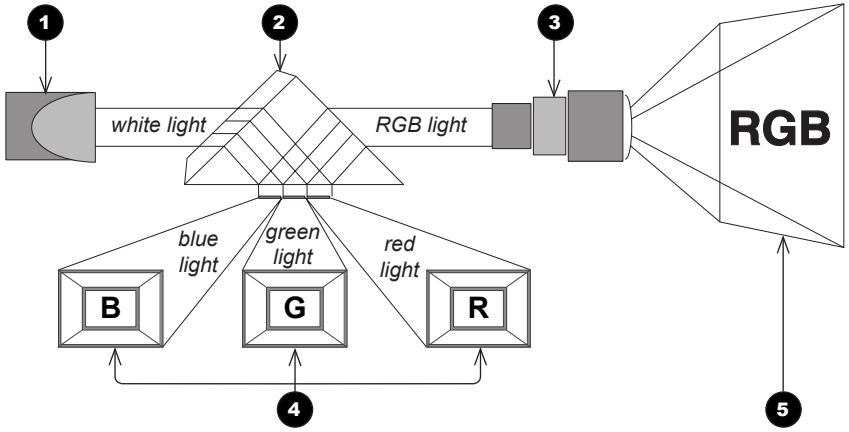
1. **Projection lens**
2. **Incoming light from the lamp**
3. **Mirror element tilted to the right**
4. **Mirror element tilted to the left**
5. **Reflected light, left tilt**
6. **Light dump**
7. **Reflected light, right tilt**



Light flow

The projector optically filters white light from the lamp into its constituent red, green and blue. Each color illuminates a separate DMD™ whose modulated output is then recombined with the other two to form the projected full color image.

1. **Lamp**
2. **Optical filtering of light into red, green and blue**
3. **Projection lens**
4. **DMD™ devices**
5. **Full color image displayed on screen**



Filtering process

Notes

Aspect Ratios Explained

The appearance of a projected image on the screen depends on a combination of the following:

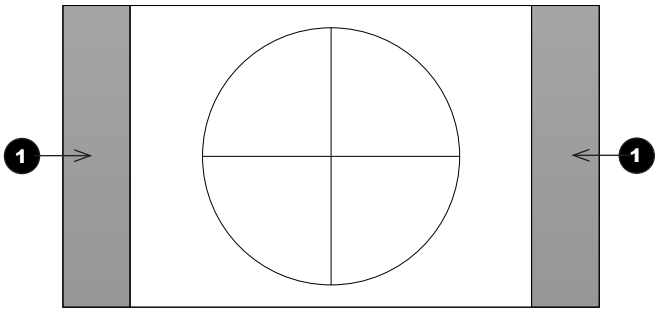
- The DMD™ resolution: **1080p** with a 1920 x 1080 resolution, corresponding to an aspect ratio of 16:9
- The aspect ratio of the input signal: **4:3**, **16:9** or **16:10**
- The value of the **Aspect Ratio** setting of the projector:
  - **16:9** forces a 16:9 ratio on the image.
  - **TheaterScope** is a special setting used in combination with an anamorphic lens, an optional accessory. It removes letterboxing from a 2.35:1 source packed into a 16:9 frame.
  - **4:3** forces a 4:3 ratio on the image.
  - **4:3 Narrow** is used to compensate for the distortion that an anamorphic lens would cause to a 4:3 image.
  - **16:10** forces a 16:10 ratio on the image.
  - **5:4** forces a 5:4 ratio on the image.
  - **Native** - no scaling. When the source does not match the DMD resolution, this setting will result in unused areas of the DMD or image clipping.

Notes

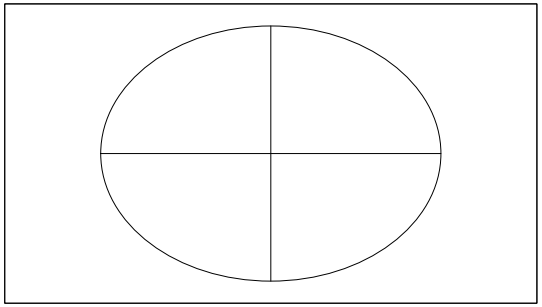
Aspect ratio examples for DMD™ resolution 1080p

Source: 4:3

1 **Unused screen areas**



Aspect Ratio: 4:3

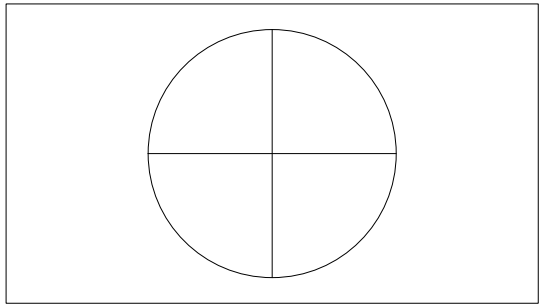


Aspect Ratio: 16:9

Notes

Aspect ratio examples for DMD™ resolution 1080p (continued)

Source: 16:9 (native resolution)



Aspect Ratio: 16:9 / Native

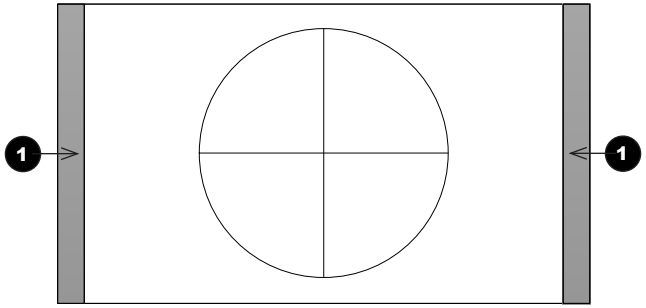
Notes

Aspect ratio examples for DMD™ resolution 1080p (continued)

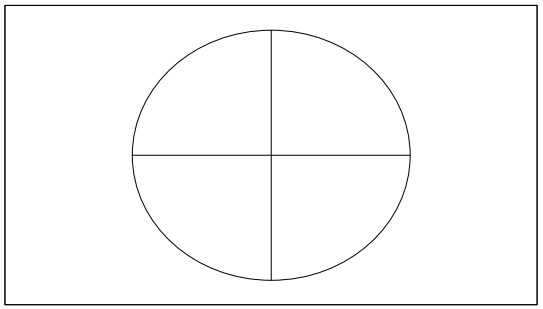
Source: 16:10

1 **Unused screen areas**

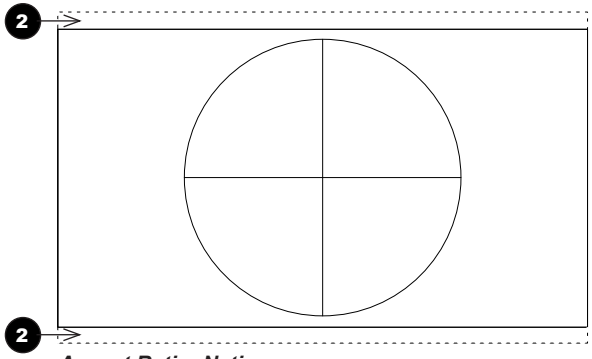
2 **Cropped parts of the image**



Aspect Ratio: 16:10



Aspect Ratio: 16:9



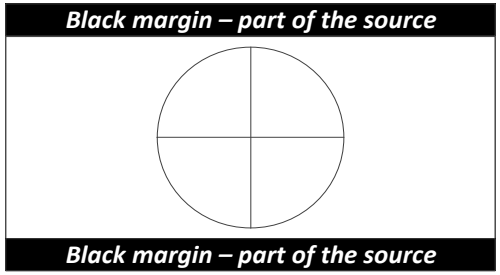
Aspect Ratio: Native

Notes

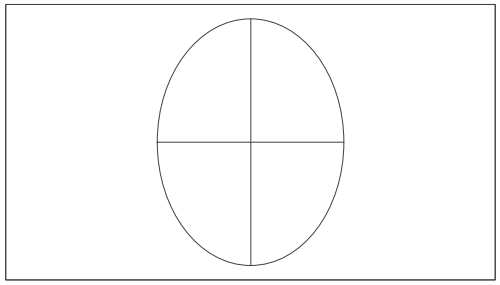
Aspect ratio example: TheaterScope

The **TheaterScope** setting is used in combination with an anamorphic lens to restore 2.35:1 images packed into a 16:9 frame. Such images are projected with black lines at the top and bottom of the 16:9 screen to make up for the difference in aspect ratios.

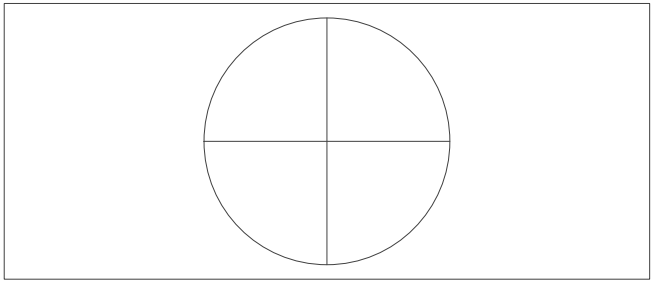
Without an anamorphic lens and without the TheaterScope setting applied, a 16:9 source containing a 2.35:1 image looks like this:



If we change the setting to **TheaterScope**, the black lines will disappear but the image will stretch vertically to reach the top and bottom of the DMD™:



An anamorphic lens will stretch the image horizontally, restoring the original 2.35 ratio:



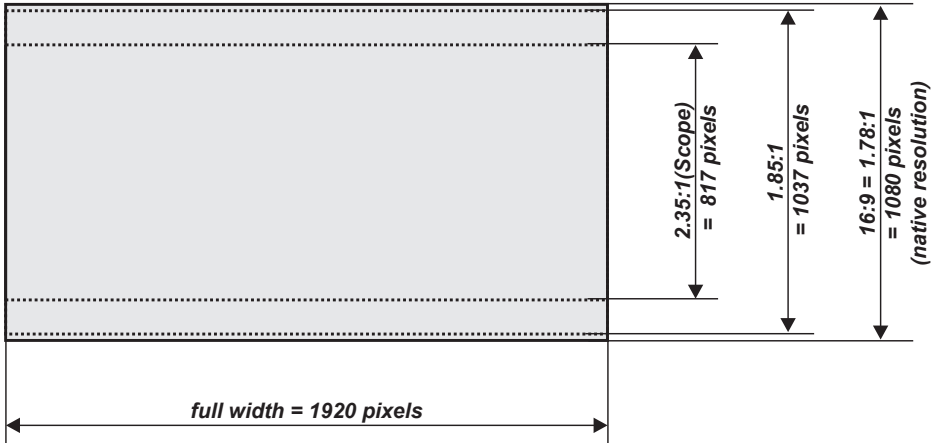
Notes

Screen Requirements

Fitting the image to the DMD™

If the source image supplied to the projector is smaller than the DMD™ resolution, the image will not fill the DMD™. The following examples show how a number of common formats may be displayed.

1080p images displayed full width

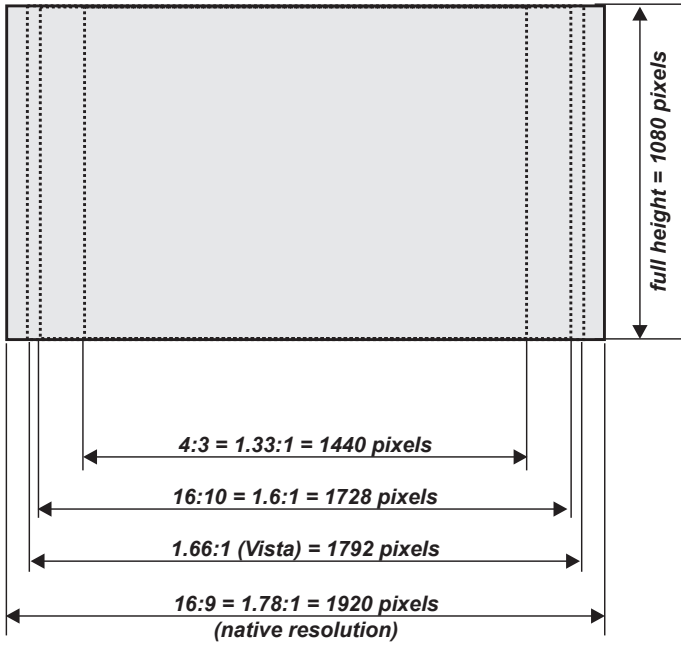


Notes

The images are shown here scaled automatically by the projector.

The image may be scaled differently if the aspect ratio is set differently in the **Main** *menu.*

1080p images displayed full height


full height = 1080 pixels
4:3 = 1.33:1 = 1440 pixels
16:10 = 1.6:1 = 1728 pixels
1.66:1 (Vista) = 1792 pixels
16:9 = 1.78:1 = 1920 pixels
(native resolution)

Notes

The images are shown here scaled automatically by the projector.

The image may be scaled differently if the aspect ratio is set differently in the **Main** *menu.*

Diagonal screen sizes

Screen sizes are sometimes specified by their diagonal size (D). When dealing with large screens and projection distances at different aspect ratios, it is more convenient to measure screen width (W) and height (H).

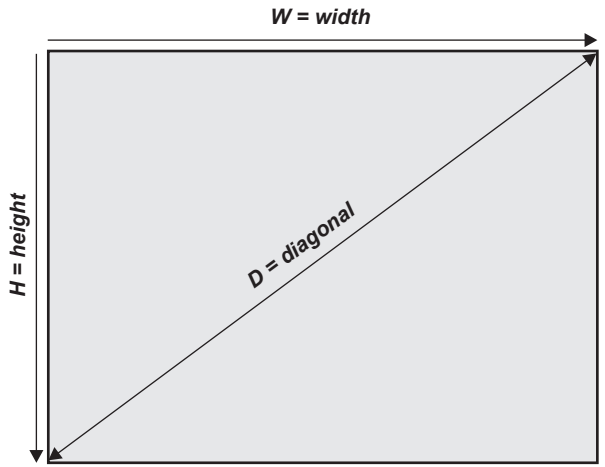
The example calculations below show how to convert diagonal sizes into width and height, at various aspect ratios.

2.35:1 (Scope)
W = D x 0.92 ***H*** = D x 0.39

1.85:1
W = D x 0.88 ***H*** = D x 0.47

16:9 = 1.78:1 (native aspect ratio for 1080p projectors)
W = D x 0.87 ***H*** = D x 0.49

1.66:1 (Vista)
W = D x 0.86 ***H*** = D x 0.52



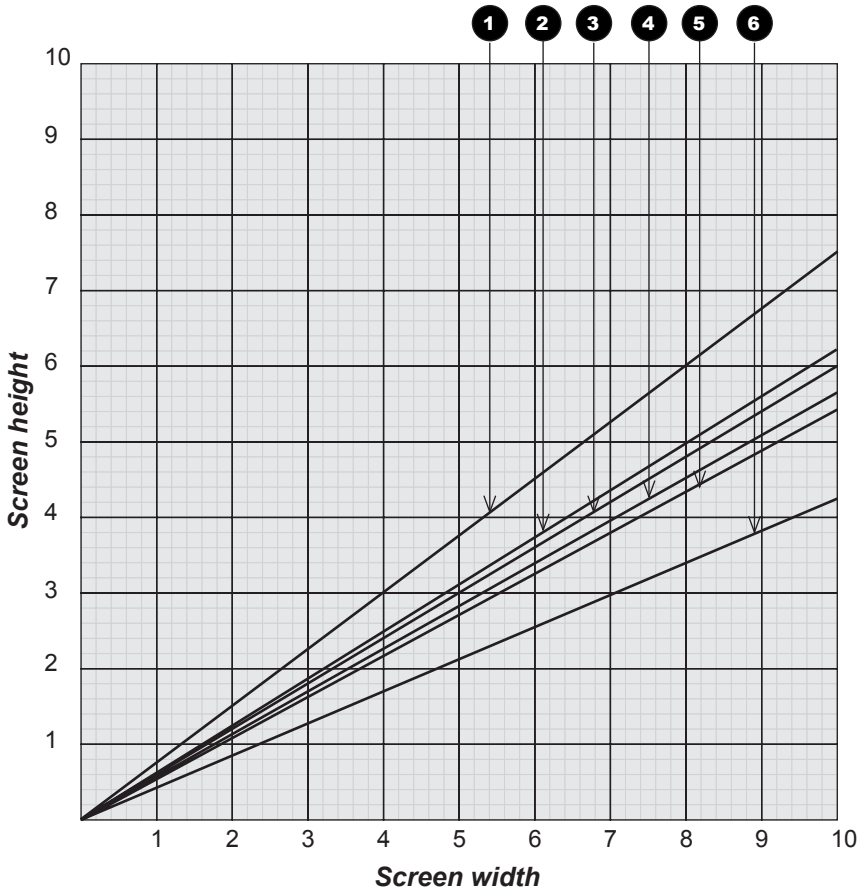
Notes

Fitting the image to the screen

It is important that your screen is of sufficient height and width to display images at all the aspect ratios you are planning to use.

Use the conversion chart, or the sample calculations below to check that you are able to display the full image on your screen. If you have insufficient height or width, you will have to reduce the overall image size in order to display the full image on your screen.

1. **4:3 = 1.33:1**
   W = H x 1.33, H = W x 0.75
2. **16:10 = 1.6:1**
   W = H x 1.6, H = W x 0.625
3. **1.66:1 (Vista)**
   W = H x 1.66, H = W x 0.6
4. **16:9 = 1.78:1 (native aspect ratio)**
   W = H x 1.78, H = W x 0.56
5. **1.85:1 (Flat)**
   W = H x 1.85, H = W x 0.54
6. **2.35:1 (Scope)**
   W = H x 2.35, H = W x 0.426

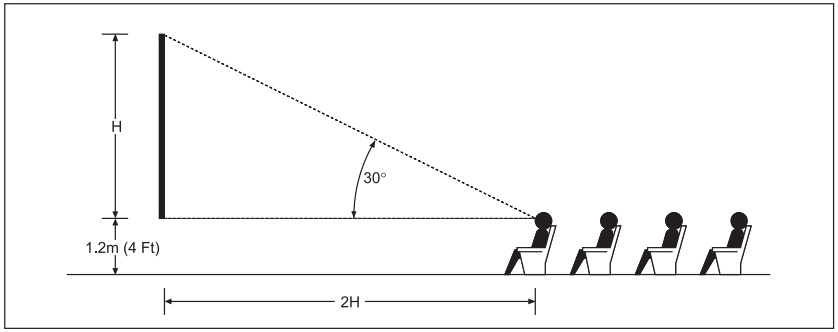


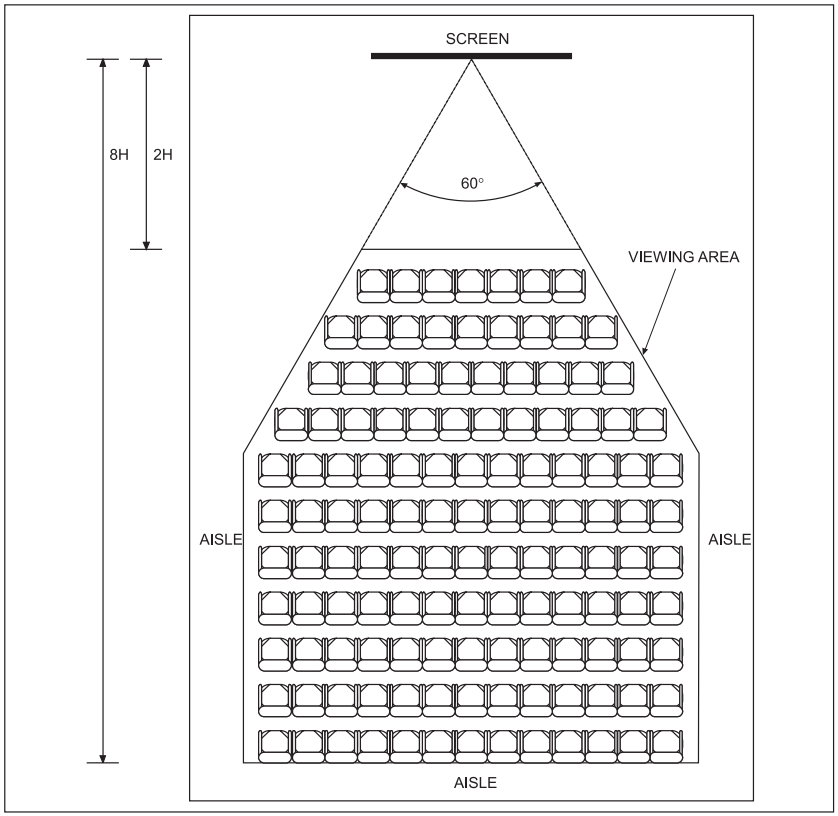
Notes

Positioning the screen and projector

For optimum viewing, the screen should be a flat surface perpendicular to the floor. The bottom of the screen should be 1.2m (4 feet) above the floor and the front row of the audience should not have to look up more than 30° to see the top of the screen.

The distance between the front row of the audience and the screen should be at least twice the screen height and the distance between the back row and the screen should be a maximum of 8 times the screen height. The screen viewing area should be within a 60° range from the face of the screen.





Notes

The projector should be installed as close to the power outlet as possible.

The power connection should be easily accessible, so that it can be disconnected in an emergency.

Ensure that there is at least 30cm (12in) of space between the ventilation outlets and any wall, and 10cm (4in) on all other sides.

Do not install the projector close to anything that might be affected by its operational heat, for instance, polystyrene ceiling tiles, curtains etc.

*The image can be flipped for rear projection (see the **Operating Guide**) and displayed without the need for extra mirrors or equipment.*

However, you must ensure that there is sufficient distance behind the screen for the projector to be correctly located.

Rear installation is generally more complicated and advice should be sought from your local dealer before attempting it.

Choosing A Lens

A number of lenses are available. Which lens you choose will depend on the screen size, image aspect ratio, projection distance and light output. In addition, each lens is available in two versions: High Brightness and High Contrast.

The lenses available are listed below:

Lens
0.77 : 1 fixed lens
1.16 : 1 fixed lens
1.45 - 1.74 : 1 zoom lens
1.74 - 2.17 : 1 zoom lens
2.17 - 2.90 : 1 zoom lens
2.90 - 4.34 : 1 zoom lens
4.34 - 6.76 : 1 zoom lens

If the image does not fill the full width of the DMD™, this effectively increases the throw ratio of the lens. This can be corrected by applying a throw ratio factor (TRF).

To choose a lens for your projector, you can either apply a lens calculation, or use the lens charts provided here for quick reference.

Notes

The High Brightness lenses are recommended for the HB model, for maximum light output.

The High Contrast lenses are recommended for the HC model, for maximum contrast.

*For more information about throw ratio factor (TRF), see **Choosing a lens by calculation** later in this section.*

*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

Choosing a lens by calculation

For any screen size not listed above, or if you need to be more precise, you can use the calculations below.

1. Identify the width of the image in pixels.
2. Calculate the throw ratio factor (TRF):

$$TRF = \frac{DMD\ width}{Image\ width\ in\ pixels}$$

3. Identify the screen width required.
4. Identify the throw distance required.
5. Calculate the throw ratio required.

$$Throw\ ratio = \frac{Throw\ distance}{Screen\ width \times TRF}$$

6. Choose a lens with the required throw ratio from the list below.
   Check from the list that the lens chosen will work at the throw distance required.

Throw ratio	Throw distance range
0.77 : 1 fixed lens	1.3 - 2.5 m (4.3 - 8.2 ft)
1.16 : 1 fixed lens	1.4 - 6.2 m (4.6 - 20.3 ft)
1.45 - 1.74 : 1 zoom lens	1.8 - 9.3 m (5.9 - 30.5 ft)
1.74 - 2.17 : 1 zoom lens	2.2 - 11.8 m (7.2 - 38.7 ft)
2.17 - 2.90 : 1 zoom lens	2.7 - 15.4 m (8.9 - 50.5 ft)
2.90 - 4.34 : 1 zoom lens	3.6 - 22.5 m (11.8 - 73.8 ft)
4.34 - 6.76 : 1 zoom lens	5.5 - 35 m (18 - 115 ft)

Notes

The throw ratio for a particular lens is fixed, but assumes that the image fills the width of the DMD.

For images that do not fill the width of the DMD, the throw ratio is effectively increased. To correct for this in these calculations, a throw ratio factor (TRF) is used.

The DMD width is 1920.

*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

Useful lens calculations

$$\text{Throw ratio} = \frac{\text{Throw distance}}{\text{Screen width} \times \text{TRF}} \qquad \text{TRF} = \frac{\text{DMD width}}{\text{Image width in pixels}}$$

$$\text{Screen width} = \frac{\text{Throw distance}}{\text{Throw ratio} \times \text{TRF}} \qquad \text{Throw distance} = \text{Screen width} \times \text{Throw ratio} \times \text{TRF}$$

Examples of lens calculations

Use the information in **Appendix A** at the end of this **Reference Guide** to identify the exact lens needed.

Image size 1024 x 768 pixels, screen width 6.5m, throw distance 18m from the outer end of the lens.

- *Throw ratio factor (TRF) = 1920 / 1024 = 1.875*
- *Throw ratio required = 18 / (6.5 x 1.875) = 1.48*

Choose ***the 1.45 - 1.75 : 1 zoom lens***.

Notes

The throw ratio for a particular lens is fixed, but assumes that the image fills the width of the DMD.

For images that do not fill the width of the DMD, the throw ratio is effectively increased. To correct for this in these calculations, a throw ratio factor (TRF) is used.

The DMD width is 1920.

*Throw distance calculations are based on the distance from the outer end of the lens, which will vary from lens to lens. Once a lens has been chosen, the figures can be checked using the lens extension values given in **Appendix A** at the end of this document.*

Lens charts

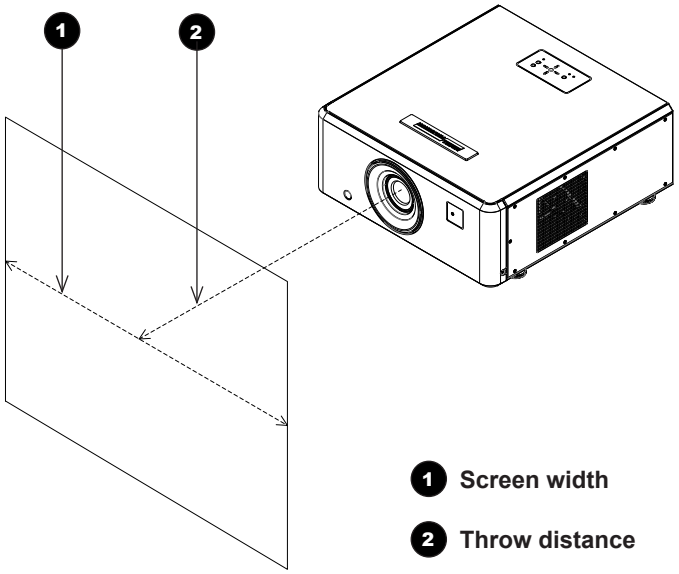
How to use the lens charts

The lens charts on the following pages provide a quick guide to the type of lens needed for a particular projector.

To use the lens charts, you need the following information:

- The DMD resolution of your projector
- The distance between the projector and the screen (throw distance)
- The maximum width of your screen

In the chart for the required DMD resolution, find the point where the throw distance corresponds to the screen width, as shown in the example below.



1 **Screen width**

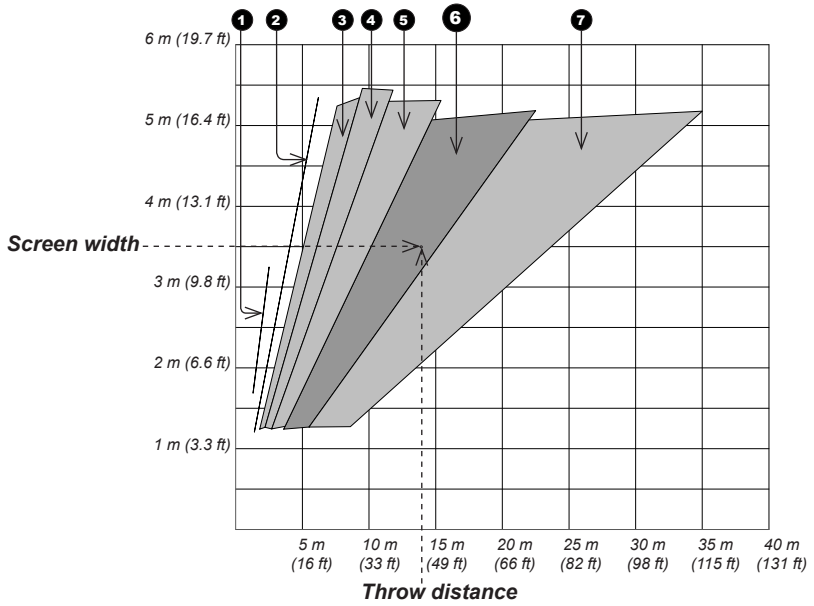
2 **Throw distance**

Example

For a 1080p projector with

- throw distance 14 m, and
- screen width 3.5 m,

the correct lens would be number 6 in the chart.



Notes

*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

1080p (1920 x 1080 pixels)

Full width images

Formats that fit the width of the DMD™ without applying a throw ratio factor (TRF) include:

- **2.35:1 (Scope)** 1920 x 817 pixels TRF = 1
- **1.85:1 (Flat)** 1920 x 1037 pixels TRF = 1
- **1.78:1 (16:9)** 1920 x 1080 pixels (native resolution) TRF = 1

Full height images

A throw ratio factor (TRF) has been applied to the following charts:

- **1.25:1 (5:4)** 1350 x 1080 pixels TRF = 1.42
- **1.33:1 (4:3)** 1440 x 1080 pixels TRF = 1.33
- **1.6:1 (16:10)** 1728 x 1080 pixels TRF = 1.11
- **1.66:1 (Vista)** 1792 x 1080 pixels TRF = 1.07

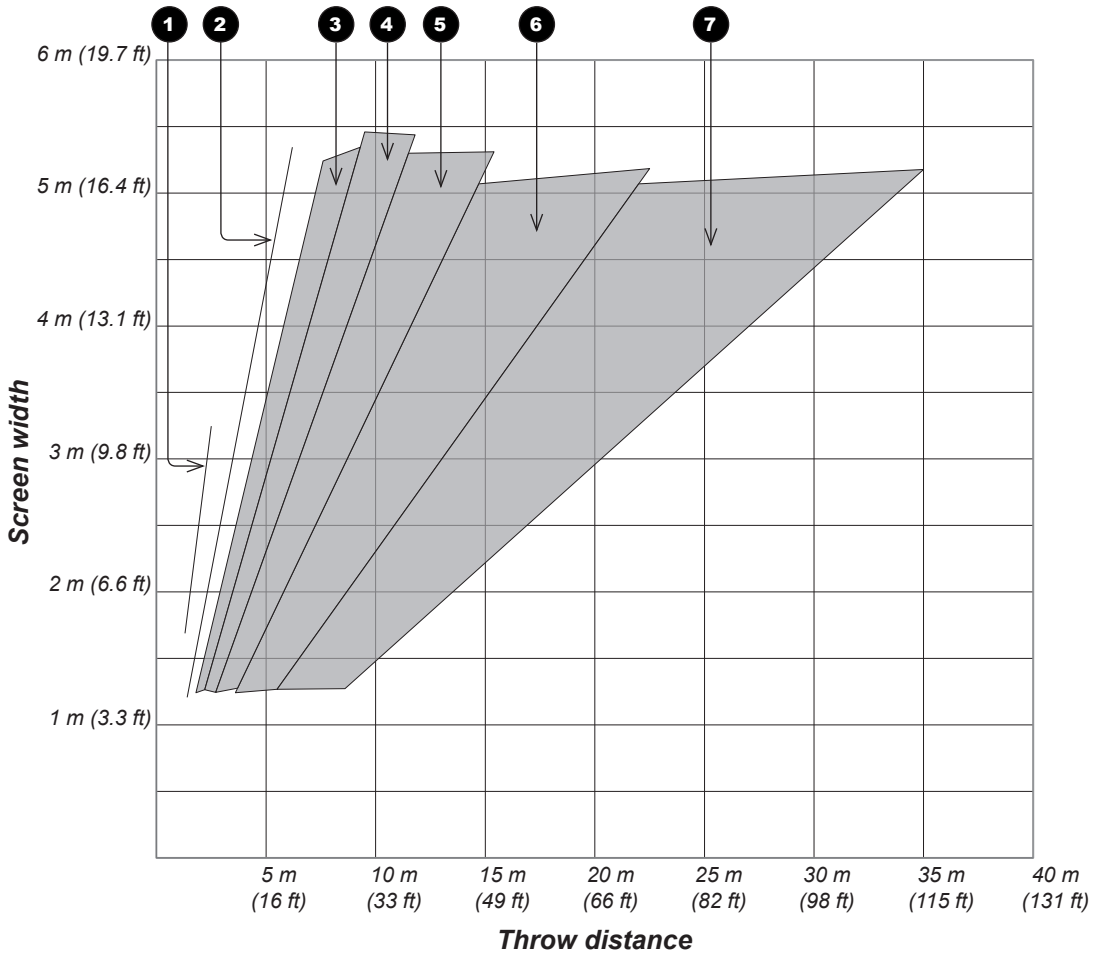
Notes

*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

DMD™ resolution 1080p, full DMD™ width images

For 1080p, full width images are 2.35:1 (Scope), 1.85:1 (Flat) 1.78:1 (native).

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

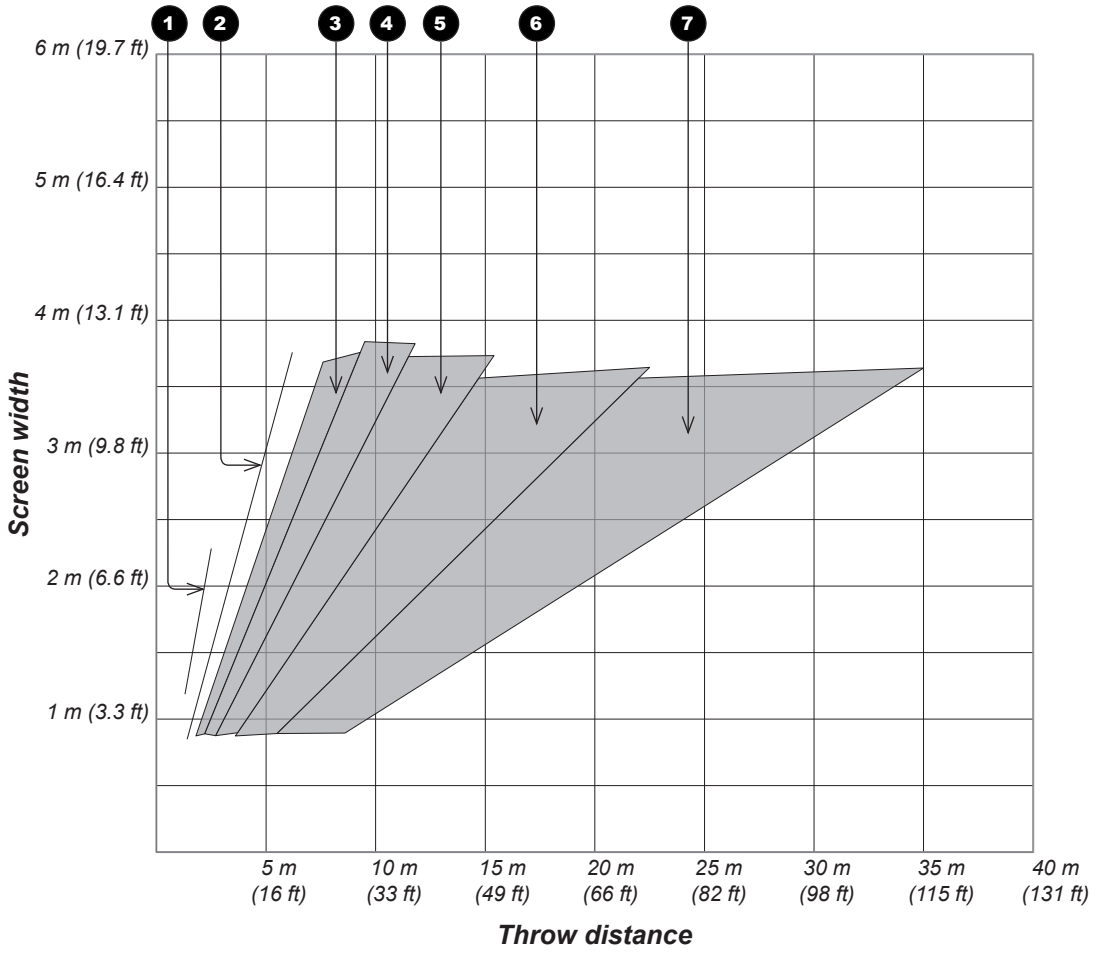
This chart has a TRF of 1.0, for use with the following images:

2.35:1 (Scope), 1.85:1 (Flat) and 1.78:1 (native)

*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

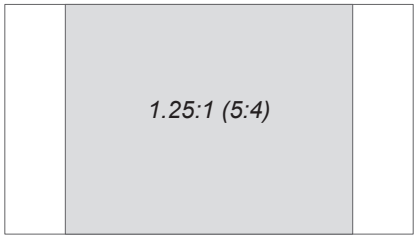
DMD™ resolution 1080p, 1.25:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

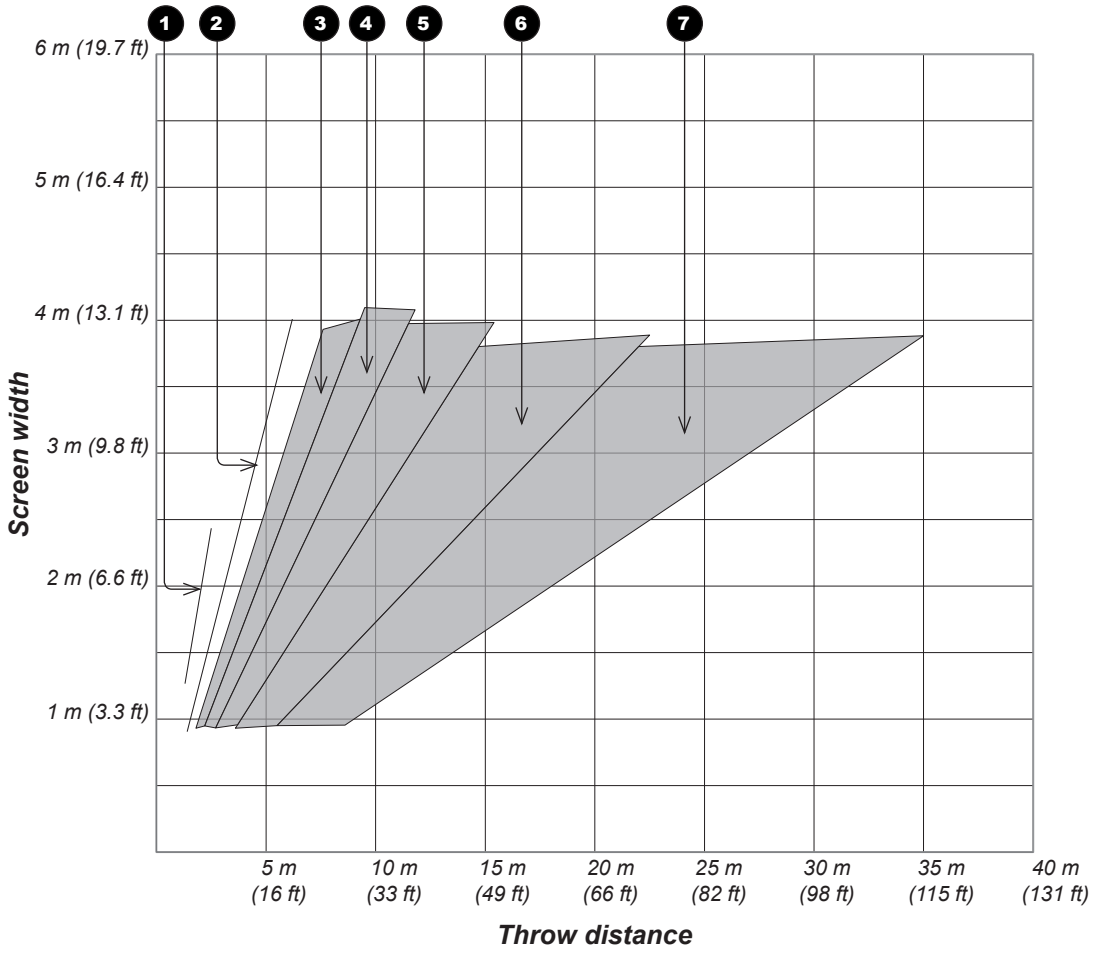
This chart has a TRF of 1.42, for use with the following images:



*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

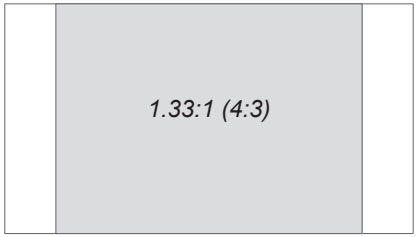
DMD™ resolution 1080p, 1.33:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

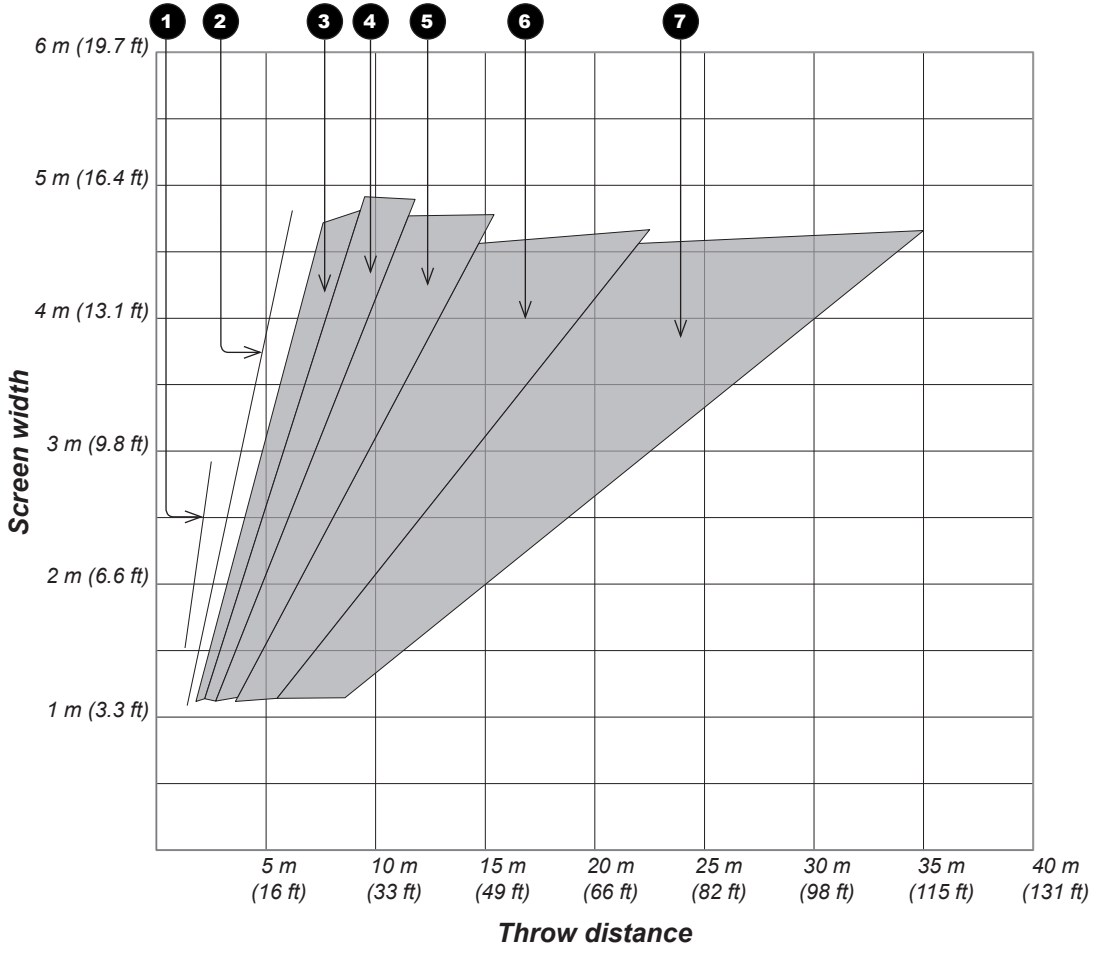
This chart has a TRF of 1.33, for use with the following images:



*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

DMD™ resolution 1080p, 1.6:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

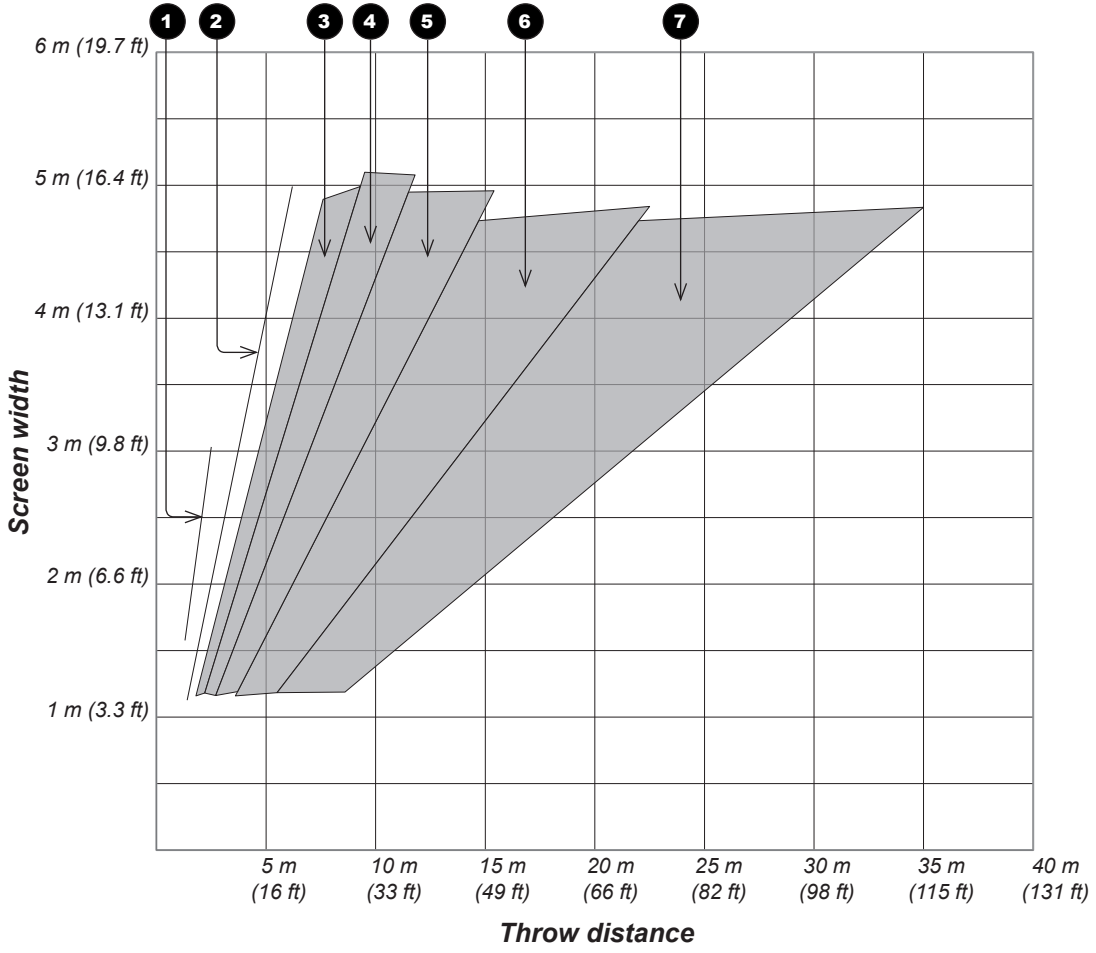
This chart has a TRF of 1.11, for use with the following images:

1.6:1 (16:10)

*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

DMD™ resolution 1080p, 1.66:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

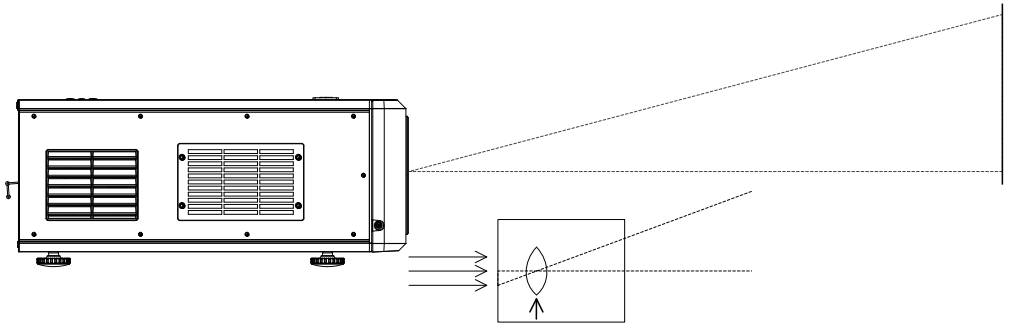
This chart has a TRF of 1.07, for use with the following images:

1.66:1 (Vista)

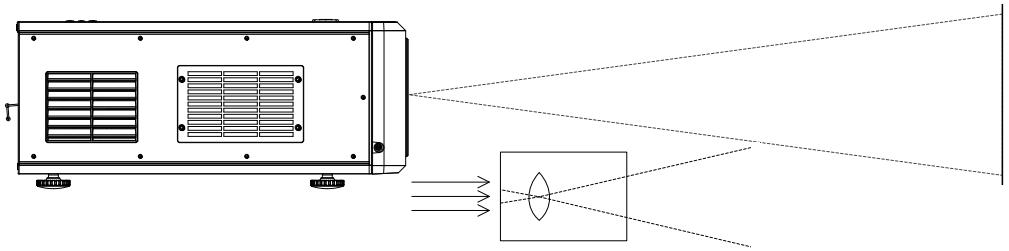
*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

Positioning The Image

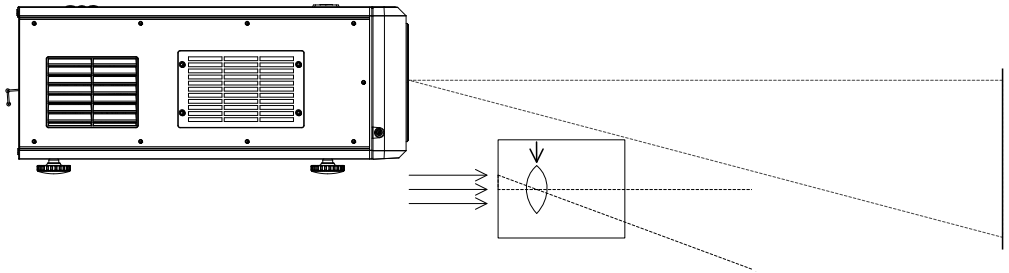
The normal position for the projector is at the centre of the screen. However, you can set the projector above or below the centre, or to one side, and adjust the image using the **Lens shift** feature (known as ***rising and falling front***) to maintain a geometrically correct image.



Shifting the lens up (rising front)



Centered lens



Shifting the lens down (falling front)

Notes

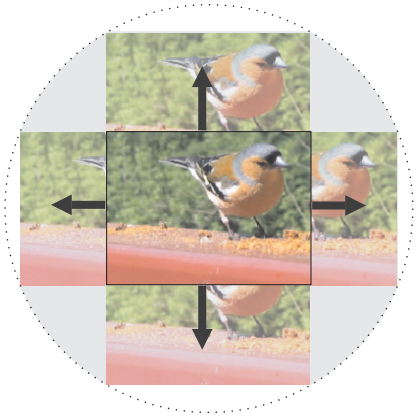
*For more information on shifting the lens, see **Control menu** in the **Operating Guide**.*

Whenever possible, position the projector so that the lens is centered for the highest quality image.

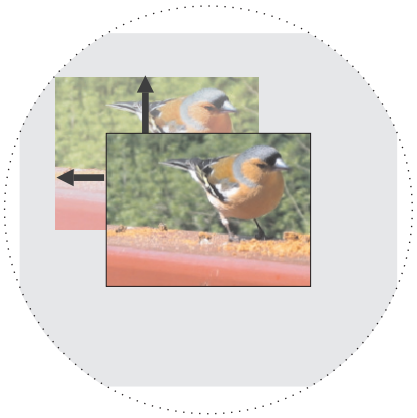
Positioning The Image (continued)

Any single adjustment outside the ranges specified on the following page may result in an unacceptable level of distortion, particularly at the corners of the image, due to the image passing through the periphery of the lens optics.

If the lens is to be shifted in two directions combined, the maximum range without distortion will be somewhat less, as can be seen in the illustrations below.



Full horizontal or vertical shift



Combined shift is reduced

Notes

*For more information on shifting the lens, see **Control menu** in the **Operating Guide**.*

Maximum offset range

The maximum offset range available with no distortion or vignetting is dependent on which lens is used. Shifting the lens beyond its undistorted limits may be physically possible, however you may experience some vignetting or distortion.

for 1080p projectors	**vertical (pixels)**	**horizontal (pixels)**	**vertical (frames)**	**horizontal (frames)**
0.77 : 1 and 1.16:1 fixed lens	±216	±96	±0.2	±0.05
all zoom lens	±648	±288	±0.6	±0.15

Notes

*For more information on shifting the lens, see **Control menu** in the **Operating Guide***

Input Connections

To get the best possible image from a source it is important to use the highest quality connection. The following lists show the inputs sorted by highest quality connection first:

Computer source

- **HDMI 1 & 2**
  Receives digital signal from HDMI-compliant devices.
- **RGB**
  Receives analog signal from a computer. When using this input, it is best to use a fully wired VGA cable to connect the source to the projector. This will allow the source to determine the projector's capabilities via DDC and show an optimized image. Such cables can be identified as they have a blue connector shell.

Video source

- **Component 1 & 2**
  RGsB or YPbPr/YCbCr

EDID on the RGB input

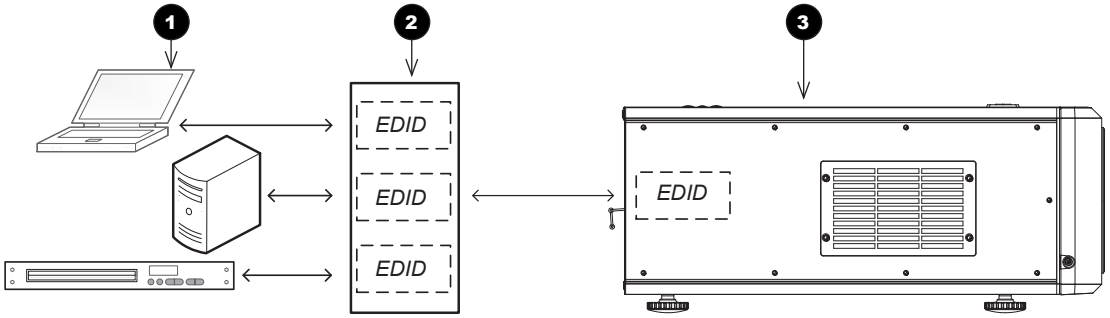
If you are using a computer DVI card or another source that obeys the EDID protocol, the source will automatically configure itself to suit the projector.

Otherwise please refer to the documentation supplied with the source to manually set the resolution to the DMD™ resolution of the projector or the nearest suitable setting. Switch off the source, connect to the projector, then switch the source back on again.

Using HDMI/DVI switchers with the projector

When using an HDMI/DVI source switcher with the projector, it is important to set the switcher so that it passes the projector EDID through to the source devices. If this is not done, the projector may not be able to lock to the source or display the source correctly as its video output timings may not be compatible with those of the projector. Sometimes this is called transparent, pass-through or clone mode. Please see your switcher's manual for information on how to set this mode.

1. **Sources**
2. **Switcher**
3. **Projector**



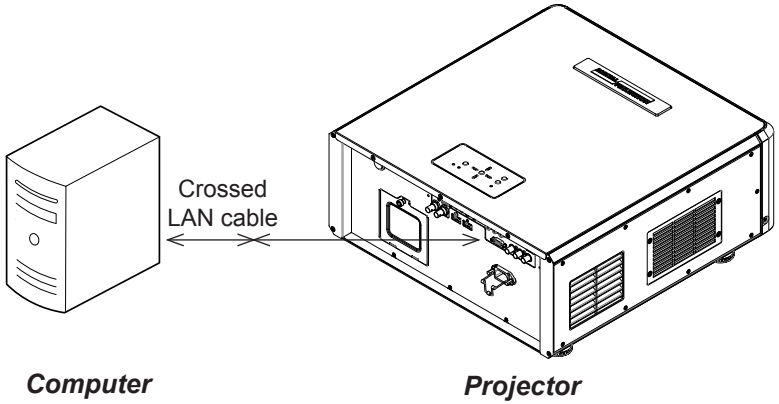
The EDIDs in the switcher should be the same as the one in the projector.

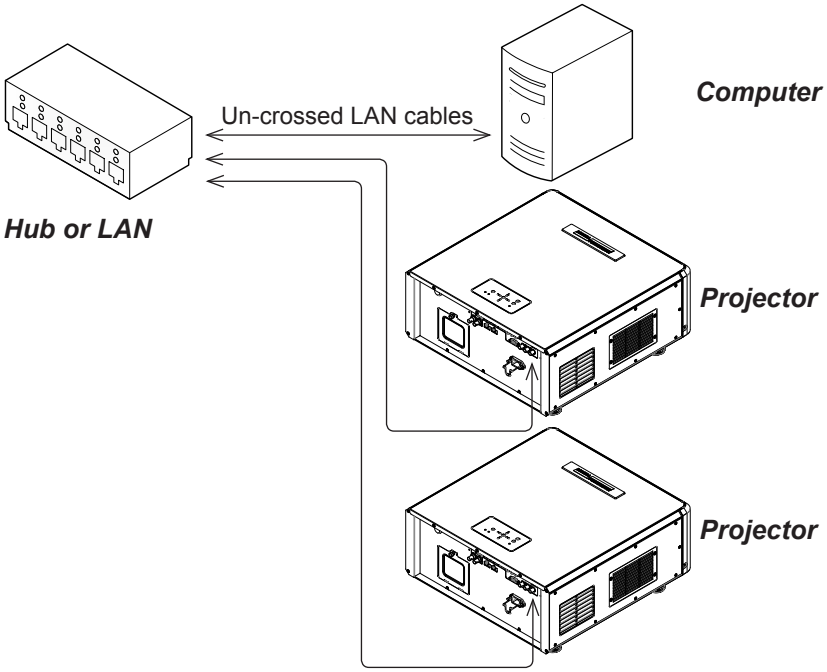
Notes

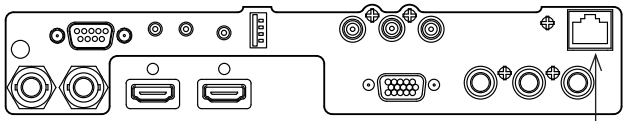
Control Connections

LAN connection

The projector's features can be controlled via a LAN connection.





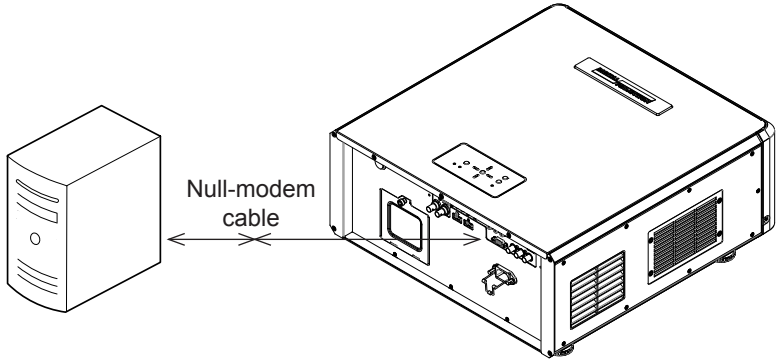


1 **LAN**

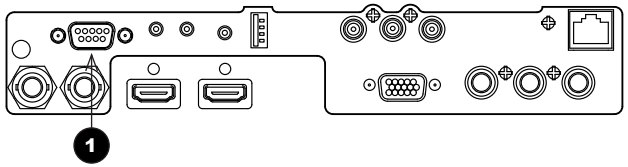
Notes

For more information, see the ***Remote Communications Guide***

RS232 connection



Computer ***Projector***



Connection panel

1 **RS232**

Notes

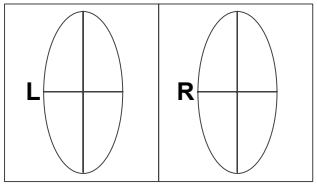
For more information, see the ***Remote Communications Guide***

3D Setup

In most situations you can use the **Auto** setting to have the projector automatically detect the format. Otherwise, consider the notes below to help you set up the 3D input manually.

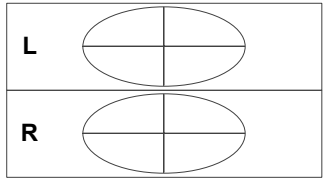
The following 3D formats are supported:

- **Side by Side (Half)**: interlaced and progressive, 50 and 60Hz
  The side-by-side image will be de-interlaced (if appropriate), resized and then sequentially displayed at 100 or 120Hz. The left eye / right eye dominance will be automatically extracted from the video data, however you will need to optimize **Dark Time** and **Sync Delay** manually to suit your chosen switching glasses.
  When 3D is disabled, 1080i will be treated conventionally. For a 60Hz **Side by Side (Half)** source the two halves of the image will automatically be extracted to create a displayed rate of twice the input rate.



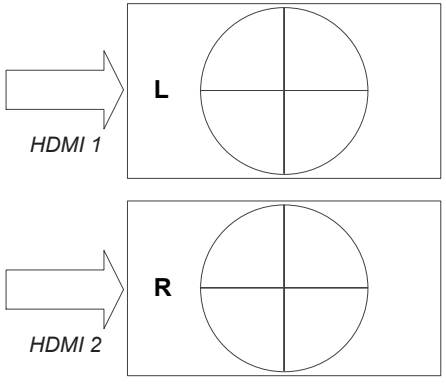
Side by Side (Half)

- **Top and Bottom**
  Sets the projector to reformat the video frames and map them to the display with the left eye / right eye dominance automatically extracted from the video data. You need to optimize **Dark Time** and **Sync Delay** manually to suit your chosen switching glasses. For a 60Hz **Top and Bottom** source, the two halves of the image will automatically be extracted to create a displayed rate of twice the input rate.



Top and Bottom

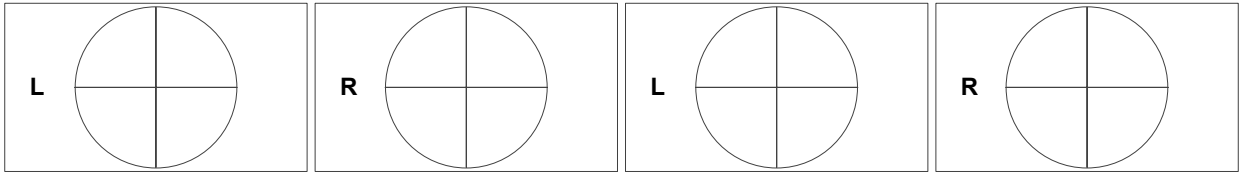
- **Dual-Pipe (HDMI 1 and HDMI 2)**
  The left and right eye images are delivered on two separate HDMI links, which the projector will interleave for 3D display.



Dual-Pipe

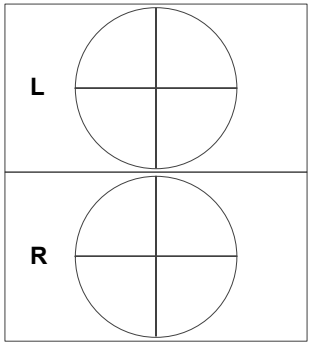
Notes

- **Frame Sequential**
  The HDMI inputs will accept frame rates up to 60Hz and multiply the frame rate for display. An example would be 60Hz (30 frames per eye in Left-Right sequence (L1, R1, L2, R2…), which is frame doubled, resulting in a displayed sequence at 120Hz (L1, R1, L1, R1, L2, R2, L2, R2…).
  For sequential 3D, an external sync is required to identify left and right frames. If no sync is available from the sequential source, the projector will generate an output sync, but it may then be necessary to manually reset the dominance each time the player is started.



Frame Sequential

- **Frame Packing**
  This format will be detected, re-synchronised, frame-multiplied and displayed at 144Hz with the left eye / right eye dominance automatically extracted from the video data. You need to optimize **Dark Time** and **Sync Delay** manually to suit your chosen switching glasses.



Frame Packing

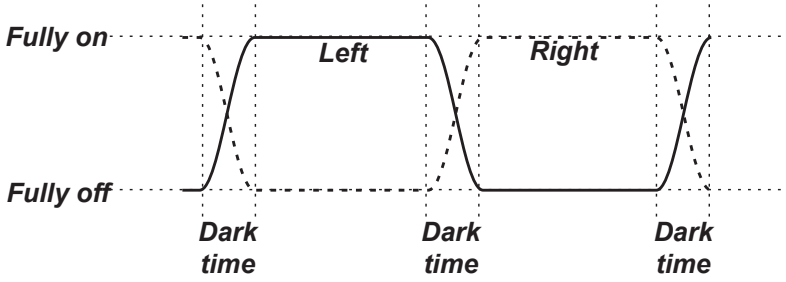
Dark Time and **Sync Delay** need to be set only once, to optimize the image for the glasses in use.

Notes

Some 3D settings explained

Dark Time

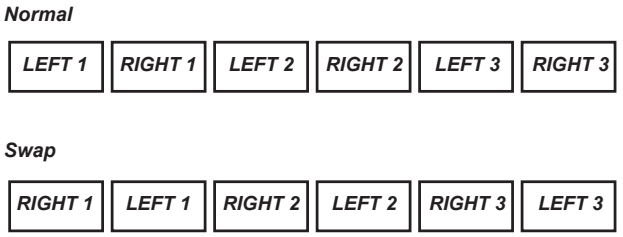
Ghosting can be caused by the left and right images overlapping during the time that the ZScreen or 3D glasses are switching. **Dark Time** allows you to minimize this effect.



3D Swap

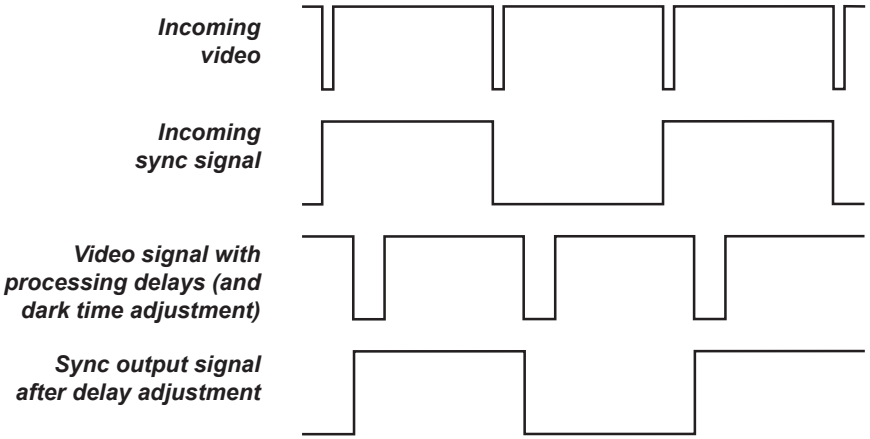
The outgoing 3D frames are in pairs - the dominant frame being presented first. You can determine which frame should be the dominant one.

By convention the default setting is **Normal**.



Sync Delay

The sync signal from the 3D server will be in phase with the frames generated by its graphics card. However, to compensate for processing delays in the projector, **Sync Delay** introduces a delay to the sync output signal sent to the ZScreen or 3D glasses.


Incoming video
Incoming sync signal
Video signal with processing delays (and dark time adjustment)
Sync output signal after delay adjustment

Notes

In order to achieve maximum light output and a smooth grayscale, whilst eliminating ghosting, the following procedure is recommended:

1. *Set the* **Dark Time** *to a value appropriate to the glasses or ZScreen, say 0.65 ms or 1.3ms.*
2. *Adjust the* **Sync Delay** *time to eliminate ghosting and achieve a smooth grayscale.*
3. *Repeat steps 1 and 2 until the best result is obtained.*

Appendix A: Lens Part Numbers

Throw ratios	Part number for High Brightness lens	Part number for High Contrast lens	Throw distance range
0.77 : 1 fixed lens	110-808	110-022	1.3 - 2.5 m (4.3 - 8.2 ft)
1.16 : 1 fixed lens	110-809	110-023	1.4 - 6.2 m (4.6 - 20.3 ft)
1.45 - 1.74 : 1 zoom lens	110-803	110-017	1.8 - 9.3 m (5.9 - 30.5 ft)
1.74 - 2.17 : 1 zoom lens	110-804	110-018	2.2 - 11.8 m (7.2 - 38.7 ft)
2.17 - 2.90 : 1 zoom lens	110-805	110-019	2.7 - 15.4 m (8.9 - 50.5 ft)
2.90 - 4.34 : 1 zoom lens	110-806	110-020	3.6 - 22.5 m (11.8 - 73.8 ft)
4.34 - 6.76 : 1 zoom lens	110-807	110-021	5.5 - 35 m (18 - 115 ft)

Notes

The Throw ratio for a particular lens is fixed, but assumes that the image fills the width of the DMD.

For images that do not fill the width of the DMD, the throw ratio is effectively increased. To correct for this in these calculations, a throw ratio factor (TRF) is used.

Throw distance calculations are based on the distance from the outer end of the lens, which will vary from lens to lens.

The High Brightness lenses are recommended for the HB model, for maximum light output.

The High Contrast lenses are recommended for the HC model, for maximum contrast.

Appendix B: Supported Signal Input Modes

2D input modes

Standard		Resolution	Vertical Frequency (Hz)	Total number of lines	Horizontal Frequency (kHz)	Component	VGA	HDMI
SDTV	480i	720 x 480	59.94	525	15.73	✓		
	576i	720 x 576	50.00	625	15.63	✓		
EDTV	480p59	720 x 480	59.94	525	31.47	✓		✓
	480p60	720 x 480	60.00	525	31.50	✓		✓
	576p50	720 x 576	50.00	625	31.25	✓		✓
HDTV	720p50	1280 x 720	50.00	750	37.50	✓		✓
	720p59	1280 x 720	59.94	750	44.96	✓		✓
	720p60	1280 x 720	60.00	750	45.00	✓		✓
	1080p23	1920 x 1080	23.98	1125	26.97	✓		✓
	1080p24	1920 x 1080	24.00	1125	27.00	✓		✓
	1080p25	1920 x 1080	25.00	1125	28.13	✓		✓
	1080p29	1920 x 1080	29.97	1125	33.72	✓		✓
	1080p30	1920 x 1080	30.00	1125	33.75	✓		✓
	1080i50	1920 x 1080	50.00	1125	28.13	✓		✓
	1080p50	1920 x 1080	50.00	1125	56.25	✓		✓
	1080i60	1920 x 1080	60.00	1125	33.75	✓		✓
	1080p60	1920 x 1080	60.00	1125	67.50	✓		✓

Notes

Standard		Resolution	Vertical Frequency (Hz)	Total number of lines	Horizontal Frequency (kHz)	Component	VGA	HDMI
COMPUTER	VGA59	640 x 480	59.94	525	31.47		✓	✓
	VGA60	640 x 480	60.00	525	31.50		✓	✓
	MACI	640 x 480	66.67	525	35.00		✓	✓
	VGA75	640 x 480	75.00	500	37.50		✓	✓
	SVGA50	800 x 600	49.92	621	31.00		✓	✓
	SVGA60	800 x 600	60.32	628	37.88		✓	✓
	SVGA75	800 x 600	75.00	625	46.88		✓	✓
	XGA60	1024 x 768	60.00	806	48.36		✓	✓
	XGA70	1024 x 768	70.07	806	56.48		✓	✓
	XGA75	1024 x 768	75.03	800	60.02		✓	✓
	XGA+75	1152 x 864	75.00	900	67.50		✓	✓
	WXGA50	1280 x 720	49.83	744	37.07		✓	✓
	WXGA60	1280 x 720	59.86	748	44.77		✓	✓
	WXGA60	1280 x 768	59.87	798	47.78		✓	✓
	SXGA-60	1280 x 960	60.00	1000	60.00		✓	✓
	SXGA60	1280 x 1024	60.02	1066	63.98		✓	✓
	SXGA75	1280 x 1024	75.02	1066	79.98		✓	✓
	HD60	1360 x 768	59.80	798	44.72			✓
	SXGA+60	1400 x 1050	59.98	1089	65.32		✓	✓
	WSXGA60	1536 x 960	59.91	996	59.67			✓
	UXGA60	1600 x 1200	60.00	1250	75.00		✓	✓
	WSXGA+60	1680 x 1050	59.95	1089	65.29		✓	✓
	FHD50	1920 x 1080	49.92	1114	55.62		✓	✓
	FHD60	1920 x 1080	59.93	1125	66.59		✓	✓
	WUXGA60	1920 x 1200	59.95	1235	74.04		✓	✓

Notes

3D input modes

Standard	Resolution	Vertical Frequency (Hz)	Total number of lines	Horizontal Frequency (kHz)	HDMI	Dual Pipe
SXGA60 Dual Pipe	1280 x 1024	60.02	1066	63.98		✓
SXGA+60 Dual Pipe	1400 x 1050	60.00	1089	65.34		✓
SXGA+60 Frame Sequential	1400 x 1050	60.00	1089	65.34	✓	
UXGA60 Dual Pipe	1600 x 1200	60.00	1250	75.00		✓
WSXGA+60 Dual Pipe	1680 x 1050	59.94	1089	65.27		✓
WSXGA+60 Frame Sequential	1680 x 1050	59.94	1089	65.27	✓	
WUXGA60 Dual Pipe	1920 x 1200	60.00	1235	74.10	✓	
720p50 Frame Packing	1280 x 720	50.00	750	37.50	✓	
720p60 Frame Packing	1280 x 720	60.00	750	45.00	✓	
720p50 Side-by-Side (Half)	1280 x 720	50.00	750	37.50	✓	
720p60 Side-by-Side (Half)	1280 x 720	60.00	750	45.00	✓	
720p50 Top-and-Bottom	1280 x 720	50.00	750	37.50	✓	
720p60 Top-and-Bottom	1280 x 720	60.00	750	45.00	✓	
720p50 Dual Pipe	1280 x 720	50.00	750	37.50		✓
720p60 Dual Pipe	1280 x 720	60.00	750	45.00		✓
720p50 Frame Sequential	1280 x 720	60.00	750	45.00	✓	
720p60 Frame Sequential	1280 x 720	60.00	750	45.00	✓	
1080i50 Side-by-Side (Half)	1920 x 1080	50.00	1125	56.25	✓	
1080i60 Side-by-Side (Half)	1920 x 1080	60.00	1125	67.50	✓	
1080p23 Frame Packing	1920 x 1080	23.98	1125	26.98	✓	
1080p23 Side-by-Side	1920 x 1080	23.98	1125	26.98	✓	
1080p23 Top and Bottom	1920 x 1080	23.98	1125	26.98	✓	

Notes

Standard	Resolution	Vertical Frequency (Hz)	Total number of lines	Horizontal Frequency (kHz)	HDMI	Dual Pipe
1080p23 Dual Pipe	1920 x 1080	23.98	1125	26.98		✓
1080p24 Frame Packing	1920 x 1080	24.00	1125	27.00	✓	
1080p24 Side-by-Side (Half)	1920 x 1080	24.00	1125	27.00	✓	
1080p24 Top and Bottom	1920 x 1080	24.00	1125	27.00	✓	
1080p24 Dual Pipe	1920 x 1080	24.00	1125	27.00		✓
1080p30 Frame Packing	1920 x 1080	30.00	1125	33.75	✓	
1080p30 Side-by-Side (Half)	1920 x 1080	30.00	1125	33.75	✓	
1080p30 Top and Bottom	1920 x 1080	30.00	1125	33.75	✓	
1080p30 Dual Pipe	1920 x 1080	30.00	1125	33.75		✓
1080p50 Side-by-Side (Half)	1920 x 1080	50.00	1125	56.25	✓	
1080p50 Top and Bottom	1920 x 1080	50.00	1125	56.25	✓	
1080p50 Dual Pipe	1920 x 1080	50.00	1125	56.25		✓
1080p50 Frame Sequential	1920 x 1080	50.00	1125	56.25	✓	
1080p60 Side-by-Side (Half)	1920 x 1080	60.00	1125	67.50	✓	
1080p60 Top and Bottom	1920 x 1080	60.00	1125	67.50	✓	
1080p60 Dual Pipe	1920 x 1080	60.00	1125	67.50		✓
1080p60 Frame Sequential	1920 x 1080	60.00	1125	67.50	✓	

Notes

Appendix C: Glossary Of Terms

Notes

1080p

An ***HDTV resolution*** which corresponds to 1920 x 1080 pixels (a widescreen ***aspect ratio*** of 16:9).

3D active glasses

Wireless battery-powered glasses with LCD shutters. Synchronization information is communicated to the glasses by means of an infrared (IR) or radio frequency (RF) emitter which is connected to the Sync Out terminal on the projector. IR or RF pulses are transmitted by the emitter to signal when the left eye and right eye images are being displayed. The glasses incorporate a sensor which detects the emitter's signal and synchronises the left and right eye shutters with the projected image.

3D passive glasses

Passive glasses do not require a power source to work. Light with left-hand polarisation can pass through the left lens and light with right-hand polarisation can pass through the right-hand lens. These glasses are used in conjunction with another device which polarizes the image, such as a ***ZScreen***.

Anamorphic lens

A special lens which, when used with the ***TheaterScope aspect ratio***, allows watching 2.35:1 content packed in a 16:9 source.

Aspect ratio

The proportional relationship between the width and the height of the projected image. It is represented by two numbers separated by a colon, indicating the ratio of image width and height respectively: for example, 16:9 or 2.35:1.

Not to be confused with ***resolution***.

Blanking (projection)

The ability to intentionally turn off, that is, set to black, areas around the edges of the projected image. It is sometimes referred to as "curtains" since it can be used to blank an area of image that literally falls on the curtains at the side of the screen in a movie theater. Usually no image resizing or geometric correction takes place and the "blanked" part of the image is lost.

Not to be confused with horizontal and vertical ***blanking (video signal)***.

Blanking (video signal)

The section of the video signal where there is no active video data.

Not to be confused with ***blanking (projection)***.

Brightness (electronic control)

A control which adds a fixed intensity value to every pixel in the display, moving the entire range of displayed intensities up or down, and is used to set the black point in the image (see ***Contrast***). In ***S-Video*** and ***Component Video*** signals, brightness is the same as ***luminance***.

Brightness (optical)

Describes how 'bright' an image that is projected onto a screen appears to an observer.

C

See ***Chrominance***.

Chrominance

Also known as '***C***', this is the component, or pair of components, of an ***S-Video*** or ***Component Video*** signal which describes ***color difference*** information.

Cold mirror

A mirror that preferentially reflects or transmits infra-red light. In a projector, a cold mirror is used to reflect the visible component of the lamp beam into the illumination optics and transmit the unwanted infrared radiation into an absorber.

Color difference

In ***S-Video*** or ***Component Video*** signals, the difference between specified colors and the ***luminance*** component. Color difference is zero for monochrome images.

Color gamut

The spectrum of color available to be displayed.

Notes

Color temperature

The position along the black body curve on the chromaticity diagram, normally quoted in Kelvin. It takes into account the preset values for color balance in the service set-up to take up the variations in the prism. The projector allows you to adjust this temperature (i.e. adjust the picture color temperature).

Component video

A three or four wire video interface that carries the signal split into its basic ***RGB*** components or ***luminance*** (***brightness***) and two-***color-difference*** signals (***YUV***) and ***synchronization*** signals.

Composite video

A signal line that carries ***luminance***, ***chrominance***, ***synchronization*** pulses and ***blanking***.

Contrast (electronic control)

The adjustment of the white point of the image without affecting the black point. This increases the intensity range of the displayed image.

Contrast (optical)

The intensity difference between the darkest and lightest areas of the screen.

Cr, Cb

Color difference signals used with '***Y'*** for digital ***Component Video*** inputs. They provide information about the signal color. Not to be confused with ***Pr, Pb***.

Crop

Remove part of the projected image.

Alternatively, fit an image into a frame with a different ***aspect ratio*** by removing part of the image. The image is resized so that either its length or its width equals the length or width of the frame, while the other dimension has moved outside the frame; the excess area is then cut out.

Notes

Dark time

The time inserted between frames when using ***3D active glasses***, to avoid ***ghosting*** caused by switching time between left and right eye.

DDC (Display Data Channel)

A communications link between the source and projector. DDC is used on the HDMI, DVI and VGA inputs. The link is used by the source to read the ***EDID*** stored in the projector.

Deinterlacing

The process of converting ***interlaced*** video signals into ***progressive*** ones.

DHCP (Dynamic Host Configuration Protocol)

A network protocol that is used to configure network devices so that they can communicate on an IP network, for example by allocating an IP address.

DMD™ (Digital Micromirror Device™)

The optical tool that transforms the electronic signal from the input source into an optical image projected on the screen. The DMD™ of a projector has a fixed ***resolution***, which affects the ***aspect ratio*** of the projected image.

A Digital Micromirror Device™ (DMD™) consists of moving microscopic mirrors. Each mirror, which acts as a pixel, is suspended between two posts by a thin torsion hinge. It can be tilted to produce either a bright or dark pixel.

EDID (Extended Display Identification Data)

Information stored in the projector that can be read by the source.

EDID is used on the HDMI, DVI and VGA inputs, allowing the source to automatically configure to the optimum display settings.

EDTV (Enhanced Definition Television)

A ***progressive*** digital television system with a lower resolution than ***HDTV***.

Notes

Frame rate multiplication

To stop low frame rate 3D images from flickering, frame rate multiplication can be used, which increases the displayed frame rate by two or three times.

Gamma

A nonlinear operation used to code and decode ***luminance***. It originates from the Cathode Ray Tube technology used in legacy television sets.

Ghosting

An artifact in 3D image viewing. Ghosting occurs when an image intended for one eye is partially seen by the other eye.

Ghosting can be removed by optimizing the ***dark time*** and sync delay.

HDCP (High-bandwidth Digital Content Protection)

An encryption scheme used to protect video content.

HDTV (High Definition Television)

A television system with a higher resolution than ***SDTV*** and ***EDTV***. It can be transmitted in various formats, notably ***1080p*** and 720p.

Hertz (Hz)

Cycles per second.

Horizontal Scan Rate

The rate at which the lines of the incoming signal are refreshed. The rate is set by the horizontal ***synchronization*** from the source and measured in ***Hertz***.

Hs + Vs

Horizontal and vertical ***synchronization***.

Notes

Hue

The graduation (red/green balance) of color (applicable to ***NTSC***).

Interlacing

A method of updating the image. The screen is divided in two fields, one containing every odd horizontal line, the other one containing the even lines. The fields are then alternately updated. In analog TV interlacing was commonly used as a way of doubling the refresh rate without consuming extra bandwidth.

Interleaving

The alternation between left and right eye images when displaying 3D.

IRE

A unit used to show the range from black to white in ***Composite Video*** signals.

LED (Light Emitting Diode)

An electronic component that emits light.

Letterboxing

Black margins at the top and bottom of the image. Letterboxing appears when a wider image is packed into a narrower frame without changing the original ***aspect ratio***.

Lumen

A photometric unit of radiant power. For projectors, it is normally used to specify the total amount of emitted visible light.

Luminance

Also known as '***Y***', this is the part of an ***S-Video*** or ***Component Video*** signal which affects the brightness, i.e. the black and white part.

Notes

Noise

Electrical interference displayed on the screen.

NTSC (National Television Standards Committee)

The United States standard for television - 525 lines transmitted at 60 ***interlaced*** fields per second.

OSD (on-screen display)

The projector menus allowing you to adjust various settings.

PAL (Phase Alternate Line)

The television system used in the UK, Australia and other countries - 625 lines transmitted at 50 ***interlaced*** fields per second.

Pillarboxing

Black margins at the left and right of the image. Pillarboxing appears when a narrower image is packed into a wider frame without changing the ***aspect ratio***.

Pr, Pb

Color difference signals used with '***Y'*** for analog ***Component Video*** inputs. They provide information about the signal color. Not to be confused with ***Cr, Cb***.

Progressive scanning

A method of updating the image in which the lines of each frame are drawn in a sequence, without ***interlacing***.

Resolution

The number of pixels in an image, usually represented by the number of pixels per line and the number of lines (for example, 1920 x 1200).

RGB (Red, Green and Blue)

An uncompressed ***component video*** standard.

Notes

S-Video

A video signal which has separate ***Y*** and ***C*** signals.

Saturation

The amount of color in an image.

Scope

An ***aspect ratio*** of 2.35:1.

SDTV (Standard Definition Television)

An ***interlaced*** television system with a lower resolution than ***HDTV***. For ***PAL*** and ***SECAM*** signals, the resolution is 576i; for ***NTSC*** it is 480i.

SECAM (Sequential Color with Memory)

The television system used in France, Russia and some other countries - 625 lines transmitted at 50 ***interlaced*** fields per second.

SPDIF

Sony/Philips Digital Interface. A digital audio interface standard.

SX+

A display ***resolution*** of 1400x1050 pixels with a 4:3 screen ***aspect ratio***. (Shortened from *SXGA+*, stands for *Super Extended Graphics Array Plus*.)

Synchronization

A timing signal used to coordinate an action.

TheaterScope

An ***aspect ratio*** used in conjunction with a special ***anamorphic lens*** to display 2.35:1 images packed into a 16:9 frame.

Notes

Throw distance

The distance between the screen and the projector.

Throw ratio

The ratio of the ***throw distance*** to the screen width.

TRF (Throw ratio factor)

A special number used in calculating ***throw distances*** and ***throw ratios*** when the image does not fill the width of the ***DMD™***.

The ***throw ratio*** for a particular lens is fixed but assumes that the image fills the width of the ***DMD™***. For images that do fill the full width of the ***DMD™***, TRF = 1. For images that do not fill the ***DMD™***, TRF is effectively increased.

UXGA

A display ***resolution*** of 1600x1200 pixels with a 4:3 screen ***aspect ratio***. (Stands for *Ultra Extended Graphics Array*.)

Vertical Scan Rate

The rate at which the frames of the incoming signal are refreshed. The rate is set by the vertical ***synchronization*** from the source and measured in ***Hertz***.

Vignetting

Optical cropping of the image caused by the components in the projection lens. This can happen if too much offset is applied when positioning the image using the lens mount.

Vista

An ***aspect ratio*** of 1.66:1.

WUXGA

A display ***resolution*** of 1920 x 1200 pixels with a 16:10 screen ***aspect ratio***. (Stands for Widescreen *Ultra Extended Graphics Array*.)

Notes

Y

This is the ***luminance*** input (***brightness***) from an ***S-Video*** or ***Component Video*** signal.

YUV

See ***Pr, Pb***.

ZScreen

A special kind of light modulator which polarizes the projected image for 3D viewing. It normally requires that images are projected onto a silver screen. The ZScreen is placed between the projector lens and screen. It changes the polarization of the projected light and switches between left- and right-handed circularly polarized light at the field rate.

Notes